IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW

OF

APPLIED MYCOLOGY

VOL. XV SEPTEMBER 1936

YAMAMOTO (W.) & ITO (T.). **On the brown cubical rot of Chamaecyparis obtusa S. et Z. f. formosana Hayata.**—*Ann. phytopath. Soc. Japan*, v, 4, pp. 293–307, 1 pl., 4 figs., 1936. [Japanese, with English summary.]

Chamaecyparis obtusa var. *formosana*, an occupant of the primeval forest of Formosa, is stated to be very liable to a brown rot of the heartwood caused by a fungus closely related to *Veluticeps fusca* Humph. & Long [apud Burt in his monograph of the Thelephoraceae, p. 329: *R.A.M.*, vi, p. 125], which greatly reduces the otherwise high commercial value of the timber.

Cross sections through the affected trunks show a variable number of light brown, irregularly spherical or oblong lesions, 2 to 35 by 1 to 20 cm., scattered through the heartwood. With age the colour of the patches deepens to chestnut and still later they disintegrate into friable, cuboid masses on desiccation through the shrinkage cracks extending either radially or following the annual rings. The resupinate, concentrically sulcate, dark brown or blackish, corky fruit bodies of the fungus, 1 to 12 by 0·7 to 7 cm., with free or slightly reflexed margins, develop both on the inside and outside of broken branches as well as on the wood of decorticated trunks. The flat hymenial surface is velutinous, turning from light to rusty brown and finally drab, and studded with protruding fascicles of brownish, irregularly branched, hyaline or coloured, often nodoso-septate hyphae, 3 to 5 μ in diameter. The basidia are elongated to clavate, 50 to 130 by 6·5 to 8·5 μ, with slender sterigmata, 6 to 10 μ long, and produce elliptical or elongated to elliptical, hyaline or rarely pale olivaceous basidiospores, unilaterally flattened and measuring 10 to 19 (mostly 11 to 13) by 3·5 to 5 μ.

Good growth was secured on Czapek's and various natural agars, including onion, prune, potato dextrose, malt, and soy-bean, the minimum, optimum, and maximum temperatures for mycelial development being below 10°, about 22°, and near 31° C., respectively.

HUTCHINSON (W. G.). **A method for staining rust mycelium in woody tissues.**—*Phytopathology*, xxvi, 3, pp. 293–294, 1936.

The writer describes a modification of the orseillin BB-aniline-blue-staining procedure described by Strasburger adapted for the microscopic

diagnosis of white pine blister rust [*Cronartium ribicola*]. Sections are transferred from water to a saturated solution of orseillin BB in 3 per cent. acetic acid for 10 to 12 hours, rinsed in 40 per cent. ethyl alcohol, stained with saturated aniline blue solution in 3 per cent. acetic acid for 15 to 30 minutes, rinsed in 40 per cent. ethyl alcohol, transferred successively to 95 per cent. alcohol for 2 to 5 minutes, absolute alcohol, clove oil, and then mounted in balsam. In properly differentiated tissues the mycelium stains violet to blue, lignified or suberized tissue red, parenchyma cell walls blue, nuclei and cytoplasm red, and haustoria deep red.

BAVENDAMM (W.). **Aus der Praxis der mykologischen Holzschutzmittelprüfung. I. Mitteilung.** [On the practical aspect of the mycological testing of timber preservatives. Note I.].—*Angew. Bot.*, xviii, 2, pp. 132–141, 3 figs., 1936.

Using the officially recognized wood block method for the toximetric determination of timber preservatives [*R.A.M.*, xv, p. 333], the writer tested the efficacy against *Merulius lacrymans*, *Coniophora cerebella* [*C. puteana*], and *Polyporus vaporarius* [*Poria vaporaria*] on a substratum of fir pulp saturated with 8 per cent. malt extract solution of basilite U [ibid., xiii, p. 667] (I.G. Farbenindustrie A.G., Uerdingen-am-Rhein), fluralsil-extra (Brand Dyeworks, Erbisdorf, Saxony) [ibid., xiv, p. 542], and an unspecified preparation not yet on the market. The two first-named proved equally toxic at a concentration of 0·1 to 0·2 per cent., while further technical improvements are necessary to place the last on the same level in respect of fungicidal activity, though it was conspicuously superior to the others in resistance to lixiviation. The outcome of the tests by this method confirmed previous observations as to the discrepancy of the fungicidal values obtained on the natural substratum and on agar [ibid., vii, p. 690; xi, p. 84].

WINNIG (K.). **Der übliche Fäulnisschutz bei Tannen- und Fichtenmasten und das neue Osmoseverfahren.** [The ordinary method of protection against decay in Fir and Spruce poles and the new osmotic process.]—*Elektrotech. Z.*, lvi, 31, pp. 857–858, 2 figs., 1 graph, 1935.

Full details are given of the mode of application of the osmotic process of timber preservation [*R.A.M.*, xv, p. 414], which may be carried out on fir and spruce as well as on the more rapidly reacting pine either with osmolit U (85 per cent. sodium fluoride, 10 per cent. dinitrophenolaniline, and 5 per cent. of a colloidal paste) or with osmolit U Arsen, consisting of 27·5 per cent. sodium fluoride, 37·5 per cent. potassium bichromate, 25 per cent. sodium arsenate, 10 per cent. dinitrophenol, with an added 5 per cent. of the colloidal paste. (This mixture, except for the last-mentioned ingredient, is known as thanalith U and basilite UA). One of the great advantages of the osmotic treatment is its simplicity, no technical skill or complicated apparatus being required as in the case of the ordinary methods of impregnation. A period of about three to four months is requisite for the complete absorption of the compound by the wood.

NOWAK (A.). **Fortschritte auf dem Gebiete der Holzveredlung.** [Progress in the field of wood improvement.]—*Mitt. tech. VersAmt., Wien*, xxiv, pp. 63–65, 1935. [Received April, 1936.]

Some recent improvements in the treatment of wood for structural purposes are briefly reported, including the use as preservatives of thanalith U, osmolit U, and other relatively insoluble salts [see preceding abstract]. In Austria very satisfactory results are stated to have been obtained by pressure treatment with artificial resins, which fill the pores of the wood and thus prevent its penetration by water, besides acting as protectives against fungi.

DUNLAP (A. A.). **Seedling culture in sand to prevent damping-off.**—*Phytopathology*, xxvi, 3, pp. 278–284, 1 fig., 1936.

Satisfactory development, combined with a noteworthy reduction in the incidence of the *Rhizoctonia* and *Pythium* types of damping-off [*R.A.M.*, xv, p. 484], was obtained in experiments at the Connecticut Agricultural Experiment Station with a number of seedlings, including beet, cabbage and other crucifers, celery, lettuce, pepper [*Capsicum annuum*], spinach, carrot, eggplant, cucurbits, beans [*Phaseolus vulgaris*], peas, parsley, tobacco, tomato, conifers, and various ornamentals in pure brown sea sand with the addition of a mineral nutrient solution, the type of which is relatively unimportant provided adequate amounts of nitrogen and potassium are present.

WALKER (J. C.). **Resistance to club root in Brassica.**—Abs. in *Phytopathology*, xxvi, 2, p. 112, 1936.

In greenhouse trials with Wisconsin soil naturally infested by *Plasmodiophora brassicae* [*R.A.M.*, xiv, p. 807], only 3 out of 2,600 cabbage plants of 25 varieties remained healthy and Shogoin turnips consistently showed 100 per cent. infection. On the other hand, Snowball, Purple Top Milan, and White Milan turnips remained free from the disease throughout and rutabaga varieties were generally resistant. In white and black mustard samples from America and Europe the incidence of club root ranged from 16 to to 90 per cent. In a cross between the resistant Snowball and the susceptible Shogoin turnip the F_1 hybrids numbered 441 resistant to 22 susceptible.

HARTER (L. L.). **Mosaic of Lima Beans.**—Abs. in *Phytopathology*, xxvi, 2, p. 94, 1936.

During the summer of 1935 from 5 to 10 per cent. of the plants in a Lima bean [*Phaseolus lunatus*] field in Maryland were found to be showing typical mosaic symptoms [*R.A.M.*, xi, p. 417; xv, p. 386] resembling in some respects those affecting garden beans [*P. vulgaris*: ibid., xv, p. 418] and including stunting and a noticeable reduction of yield. Up to 100 per cent. infection was obtained in inoculation tests on Lima beans with the expressed juice from diseased plants, the incubation period lasting six to seven days. The Stringless Green Refugee variety of *P. vulgaris* reacted negatively to inoculation with diseased *P. lunatus* juice, indicating that the disease is distinct from bean mosaic. Attempts to transmit the disease to broad beans (*Vicia faba*) were also unsuccessful, denoting that the mosaic of *P. lunatus* probably differs

from that of several common legumes, such as red and white clovers [*Trifolium pratense* and *T. repens*] and white sweet clover [*Melilotus alba*: loc. cit.]. Inoculations on cucumber and tobacco resulted in symptoms similar to those of cucumber mosaic [ibid., xv, p. 195].

KENDRICK (J. B.) & SNYDER (W. C.). **A vascular Fusarium disease of Radish.**—Abs. in *Phytopathology*, xxvi, 2, p. 98, 1936.

White Chinese winter radishes in California were observed in 1934 to be affected by a disease resembling cabbage yellows (*Fusarium conglutinans*). The symptoms included yellowing and shedding of the leaves (often unilateral), vascular discoloration, and severe stunting, and often terminated in death. The diseased vascular tissue yielded a *Fusarium* which caused over 90 per cent. infection in inoculation tests on white Chinese winter and Icicle radishes but was innocuous to early Jersey Wakefield cabbage and Jersey kale in the same soil. The fungus was ascertained to be a member of the *Elegans* section, producing an abundance of microconidia and terminal and intercalary chlamydospores; it is distinguishable from *F. conglutinans*, on the basis of Wollenweber's monograph on *Fusarium* [*R.A.M.*, xv, p. 321], by the deep purplish pigmentation of the cultures and occasional formation of dark sclerotia.

QUANJER (H. M.) & ROLAND (G.). **De vergelingsziekte en de mosaiekziekte van de Suiker- en Voederbiet. I. Geschiedenis van het onderzoek over de vergelingsziekte en de mosaiekziekte van de Biet. II. Onderzoek van de vergelingsziekte van de Biet, met enkele opmerkingen over de mosaiekziekte.** [The yellowing and mosaic diseases of Sugar and Fodder Beet. I. History of the investigation on the yellowing and mosaic diseases of Beet. II. Investigation on the yellowing disease of Beet, with some observations on the mosaic disease.]—*Tijdschr. PlZiekt.*, xlii, 3, pp. 45–70, 5 pl., 1936. [English summaries.]

In part I of this joint paper H. M. Quanjer traces and supplements by explanatory observations the history of virus yellows (syn. 'jaunisse', 'vergelingsziekte') of beet [*R.A.M.*, xv, p. 417 and next abstract] from 1898, when an apparently analogous condition was described by Prilleux and Delacroix, to the present day, a similar outline being given of the investigations on mosaic since 1915, when it was first reported by Lind from Denmark (*Tidsskr. Planteavl*, xxii, p. 444).

Part II, by G. Roland, is a condensed version of the paper abstracted below from another source.

[A French translation of Quanjer's paper and a reprint of Roland's full account of his investigations [see next abstract] also appear (with Flemish, German, and English summaries) as *Publ. Inst. belge Better.*, iv, 2, pp. 23–60, 5 figs., 1 diag., 1 graph, 1936.]

ROLAND (G.). **Recherches sur la jaunisse de la Betterave et quelques observations sur la mosaïque de cette plante.** [Studies on Beet yellowing and some observations on mosaic of this plant.]—*Sucr. belge*, lv, 11, pp. 213–217; 12, pp. 231–241; 13, pp. 263–268; 14, pp. 289–293, 5 figs., 1 diag., 1 graph, 1936.

A comprehensive account is given of the writer's studies at Wagen-

ingen, Holland, and in Belgium on virus yellows (yellowing) of beet [see preceding abstract], the principal features of which, as already described by Quanjer [*R.A.M.*, xiv, p. 209], are a yellow discoloration of the outer foliage, the accumulation of starch in the leaves, and gummosis of the phloem. The development of these symptoms is favoured by strong light and dry conditions. The disease was found to be transmissible by grafting and by the aphids *Myzus persicae* (in 41 out of 43 test plants) and *Aphis fabae* (22 out of 29), but not by *Chlorita flavescens* or *Lygus pratensis*. The infective principle overwinters in the roots of seed-bearers and wild beets. Analyses of healthy and diseased plants in a field at Noville, Belgium, showed significant reductions in the average weight of the leaves and roots of the latter (from 800 to 464 and from 990 to 430 gm., respectively), as well as in the sugar content of the roots (from 14·25 to 13·10 per cent., or expressed in weight, from 141 to 56 gm.). Secondary infection by *Sporodesmium putrefaciens* [ibid., xiii, p. 210] and *Uromyces betae* [see above, p. 481] was readily obtained on yellowed leaves, whereas the former was incapable of attacking healthy foliage and the latter did so only with difficulty. The control of virus yellows presents great difficulties both as regards the extermination of the insect vectors and the selection of healthy seed-bearers, in which the symptoms are frequently masked during the first year of infection. One of the first steps to be taken in combating the disease is a systematic search for alternate hosts ensuring the perpetuation of the virus from one year to the next.

The symptoms induced by beet mosaic [ibid., xv, p. 193] are of such divergent aspect that they cannot always be appropriately designated by a single term. Their development appears to be considerably retarded by powerful illumination, the normal incubation period of 11 days being extended to 22 in a test involving four hours' exposure to a neon lamp. *M. persicae*, as shown by Robbins in the United States [ibid., i, p. 230], is capable of transmitting mosaic from diseased to healthy beets.

SCHUSTER (L.). **Ein gefährlicher Zuckerrübenschadling.** [A formidable Sugar Beet pest.]—*Naturforscher*, xii, 12, pp. 415–416, 1936.

It is believed that the beet leaf bug (*Piesma quadrata*) [*Zosmenus quadratus*], the vector of crinkle [*R.A.M.*, xv, p. 477], is largely instrumental in the loss of some 1½ million zentner [nearly 74,000 tons] of sugar, corresponding to M.25,000,000, from the German harvest of 1935 which was lower by 4 per cent. than that of the previous year notwithstanding an extension of the area under sugar beets by 5 per cent. The disease, which may affect 70 or 80 per cent. of the plants in a stand or destroy the crop completely, was first reported 21 years ago from Glogau, Silesia, since when it has spread to Brandenburg, Saxony, and Anhalt, and has further been observed sporadically of recent years in Württemberg, Hesse, and Hanover. Control measures are briefly indicated.

Die Entseuchung der Zuckerrübensaat. [Sugar Beet seed disinfection.] —*Zbl. Zuckerindustr.*, xliv, 15, pp. 324–325, 1 diag., 1936.

This is an abstract of a paper by Van Scherpenberg in *Z. niederl. Zuckerfabr.*, 31st December, 1935, giving an account of the construction

and operation of Verhoeven's apparatus [*R.A.M.*, vi, p. 648] for sugar beet seed-cluster disinfection with copper sulphate against root rot (*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*) [ibid., xv, p. 337, 486], which is stated to be practised on a large scale at the sugar factories of Dinteloord and Sas van Gent. The apparatus in question can treat 6,000 kg. of seed in 24 hours, and the following points may be noted. In a laboratory test on the comparative germinative capacity of treated and untreated seed, the latter was found to exceed the former by 20 per cent. after five days. The seed is treated for three hours in copper sulphate solution at 43° C., and after drying in the hot air drying-cylinder (Büttner and Meyer) to a moisture content between 20 and 30 per cent., is subsequently spread out in a layer up to 50 cm. in height on a warmed sheet of iron until the drying process is completed, when the moisture content should not exceed 10 per cent.

Tompkins (C. M.), Richards (B. L.), Tucker (C. M.), & Gardner (W. M.). **Phytophthora rot of Sugar Beet.**—*J. agric. Res.*, lii, 3, pp. 205–216, 1 pl., 3 figs., 1936.

A brief account is given of a severe tap-root rot of sugar beet, which was first observed in 1927 in the Cache Valley of northern Utah, doing considerable damage to the crop, and has since also been found in Idaho, Colorado, and California on poorly drained or waterlogged soils, where it greatly reduced the size and sugar content of the beetroots. In the early stages of the disease, the affected plants may wilt temporarily during daytime, but later the wilting is permanent and the plant is eventually killed. Infection usually occurs at the basal end of the tap-root, and invasion progresses gradually upward. Under field conditions the affected parenchyma of the root may soften and disintegrate, only leaving the vascular bundles. Lesions may also arise on the sides and occasionally near the top of the tap-root; infrequently the lateral roots and rootlets may become infected first. Externally the lesions are predominantly mummy-brown to light seal-brown, darker brown towards the centre; internally the diseased tissue is sharply delimited from the healthy, and light to blackish brown in colour. Isolations from diseased material constantly and readily yielded *Phytophthora drechsleri* [*R.A.M.*, x, p. 755], which grew in culture at temperatures ranging from 8° to 35° C., with an optimum between 28 ° and 31°, as well as throughout a wide range of P_H values. It was experimentally shown readily to attack both wounded and unwounded beetroots in the field, and to cause a damping-off of the sugar beet seedlings at temperatures of 25° to 31° but not in the field. The fungus was pathogenic through wounds to the roots of garden beet, carrot, turnip, and parsnip, and also to potato tubers, apples, summer squash [*Cucurbita pepo*], green pepper [*Capsicum annuum*], and green tomato fruits. Unwounded summer squash, green pepper, and eggplant fruits were also attacked by the fungus.

Nagel (C. M.). **The influence of Cercospora-infected soil in relation to the epidemiology of Cercospora leaf spot on Sugar Beets.**—Abs. in *Phytopathology*, xxvi, 2, p. 103, 1936.

Cercospora beticola, the agent of leaf spot of sugar beets [*R.A.M.*, xv,

p. 486], was cultured on five types of soil, namely, peat and four loams—basic black, acid black, neutral black, and black with little organic matter. The best mycelial growth was obtained on peat. After five weeks in a closed moist chamber at 24° to 26° C. the cultures were transferred to ordinary laboratory temperatures, under which conditions the organism was shown by nutrient agar transfers to remain viable for 2¼ years. The typical symptoms of the disease developed in seedlings directly inoculated with soil cultures of *C. beticola*, while plants grown in the greenhouse on naturally infested soil showed spotting both of the cotyledonary and true leaves. A technique was developed for isolating the fungus from the soil by means of the host plant.

Borax som Middel mod Plantesygdomme. [Borax as a remedy for plant diseases.]—*Medd. Forsøgsv. Plantek. Kbh.* 249, 3 pl. 3 figs., 1936.

Brown heart of swedes, heart and dry rot of beets [*R.A.M.*, xv, p. 416, 476], and heart and dry rot of celeriac are all stated to be controllable in Denmark by the application of borax to the soil, using 15 kg. per hect. for the two first-named and 15 to 30 kg. for the last.

STUBBS (M. W.). **Viroses of the garden Pea, Pisum sativum.**—Abs. in *Phytopathology*, xxvi, 2, pp. 108–109, 1936.

Pea mosaic has been shown to be due to more than one virus. Enation mosaic (pea virus 1) [*R.A.M.*, xv, pp. 274, 418] infected soy-beans and all pea varieties used in the writer's field and greenhouse studies, causing dwarfing, foliar spotting and enations, and pod distortion [ibid., xiii, p. 415]. It was transmissible by pea aphids [*Macrosiphum pisi*] and plant extract and was inactivated by four days' ageing *in vitro* and 1 in 3,000 dilution. White lupins and several pea varieties (excluding Perfection) were infected by marble pea mosaic (virus 2 A), speckle pea mosaic (virus 2 B), and mild pea mosaic (virus 2 C), the first-named causing mottling, extensive foliar chlorosis, dwarfing, leaf-drop, and stem discoloration, the second speckled mottle, slight chlorosis, and other inconspicuous symptoms, and the third only a very faint mottling. These three viruses were also transmitted by aphids and plant extract (with abrasive) and were inactivated by one day's ageing and 1 in 1,500 dilution. All the viruses tested infected crimson clover [*Trifolium incarnatum*], broad beans [*Vicia faba*], sweet peas, and yellow sweet clover [*Melilotus officinalis*], but not red clover [*T. pratense*] or garden beans [*Phaseolus vulgaris*].

HORSFALL (J. G.) & ARNOLD (E. L.). **The problem of drilling dusted seed: effect of graphite.**—*Bull. N.Y. St. agric. Exp. Sta.* 668, 23 pp., 5 graphs, 1936.

In the spring of 1935 the seeding rate of peas dusted with red copper oxide in New York [*R.A.M.*, xv, p. 282] was reduced by up to 30 per cent. owing to the obstruction of the drills induced by increased interfacial friction between the seeds, the surfaces of which were separated by the non-lubricating dust. The difficulty may be overcome by spraying the seed with water at the rate of about 5 tablespoonfuls per bush. at seeding time, the water not being allowed time for penetration into

the seed. A much better method is to incorporate 325-mesh graphite at the rate of 1½ oz. per bush. at the time of treatment with the dust; this substance is completely inert and will not penetrate the seed, impair germination, or interfere with the protective action of the chemical. Good results have also been obtained by this means with red copper oxide-treated [ibid., xv, p. 484] spinach and wheat, copper carbonate-treated wheat, and semesan-treated cabbage.

STEVEN (W. F.). **Uromyces fabae de Bary. Occurrence of the aecidial stage on the leaves of Vicia faba L. in Britain.**—*J. Bot., Lond.*, lxxiv, 879, p. 79, 1936.

The author records the occurrence of aecidia of *Uromyces fabae* [*R.A.M.*, xv, p. 529] on a number of leaves (about 20) of young self-sown bean (*Vicia faba*) plants in a field near Cambridge in November, 1935.

BREMER (H.). **Zur Bekämpfung des Zwiebelbrandes.** [On the control of Onion smut.]—*Phytopath. Z.*, ix, 1, pp. 53–68, 4 figs., 1 diag., 1936.

Experiments were carried out at the Aschersleben [Saxony] branch of the Biological Institute to determine the value of American and German methods of combating onion smut (*Urocystis cepulae*) [*R.A.M.*, xv, p. 464], the control of which is stated to be absolutely essential for the continuance of onion cultivation in the affected fields. The somewhat laborious formalin drill process [ibid., ii, p. 460] has been partially superseded in the United States by the use of formalin dust [ibid., ix, p. 509] and other dry preparations, but none of these gave satisfactory results under local conditions. Excellent control of the disease and increased yields of up to 188 per cent. were secured, however, by treatment of the slightly moistened seed (15 c.c. water per 100 gm.) with half its weight of Präparat B (a commercial product of unknown composition).

NELSON (R.) & COCHRAN (L. C.). **Copper dusts control Celery early blight.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xviii, 3, pp. 163–169, 3 figs., 1936.

Attention is drawn to the urgent necessity of timely treatments for the control of early blight of celery (*Cercospora apii*) [*R.A.M.*, xiv, p. 563] in Michigan, where the disease has assumed a most destructive form in three out of the past four years. Equally good results were given in 1935 by eight applications, beginning on 21st June and ending on 6th August, of either copper-lime dust (25–75) or cuprocide at the rate of 50 lb. per acre (25 lb. for the second and third), the total cash return to the grower from eight dusted rows being at the rate of $400 per acre compared with $24 from six untreated, the cost of protection per acre being estimated at from $13 to $21. For the control of both early and late blight (*Septoria apii* and its var. *graveolentis*) [ibid., xiv, p. 343], 30 minutes' immersion of the seed in a 1 in 1,000 solution of corrosive sublimate is recommended, followed by four or five applications in the seed-bed of a copper-lime dust or Bordeaux mixture and in the field by treatment on the lines indicated above. The irrigation schedule should be so arranged as to keep the plants dry at night, and water should be applied only when the temperature is rising.

Richardson (J. K.). **Control of late blight of Celery.**—*Sci. Agric.*, xvi, 7, pp. 358–364, 2 figs., 1 graph, 1936.

A summary is given of five years' field experiments (up to 1935) which were carried out in the Niagara Peninsula on the control of late blight of celery (*Septoria apii-graveolentis*) [see preceding abstract] with various copper and sulphur containing sprays and dusts. The results showed that the best control was obtained by applications of 4–5–40 Burgundy or 4–4–40 Bordeaux mixtures or of 20–80 monohydrated copper sulphate-lime dust. The treatments should be started early in the season, before the celery seedlings are planted out in the field, and repeated, before rainy periods whenever possible, at sufficiently close intervals to keep the new growth covered with the fungicide.

Walker (M. N.). **A wilt-resistant Watermelon for Florida.**—*Bull. Fla agric. Exp. Sta.* 288, 13 pp., 8 figs., 1936.

In Florida watermelon wilt (*Fusarium* [*bulbigenum* var.] *niveum*) [see above, p. 486] is widespread, and large-scale growers use virgin land each year to avoid infection, though some smaller growers replant the same land after five to seven years. The continuous use of new land in this locality has almost depleted the supply, thousands of acres formerly planted with watermelons having being abandoned to scrub oak, and unless a marketable resistant variety is grown the industry must decline.

Resistance trials were begun at Leesburg in 1930, and while a number of selections showed promise which was not fulfilled in subsequent trials, one selection from the 1931 field crop tested in 1932 was of outstanding resistance and quality, and has maintained its superiority. Two types were isolated from this stock and sufficient seeds obtained from one of them in 1935 to plant several acres. This melon gave most promising results, the various selections showing resistance ranging from 75 per cent. upwards. It has been named the Leesburg melon and was developed from the Kleckley Sweet variety, many of whose characters it possesses.

Kalashnikoff (K. J.). Экологические обоснования защиты Огурцов от бактериоза в теплицах. [Control of Cucumber bacteriosis based on the ecological conditions in hothouses.]—*Pl. Prot. Leningr.*, *1935*, 3, pp. 55–59, 1935. [English summary. Received May, 1936.]

The results of the experiments briefly reported in this paper showed that angular leaf spot (*Bacterium lacrymans*) [*R.A.M.*, xv, p. 197] of cucumber in hothouses in the neighbourhood of Leningrad can be economically controlled by constantly maintaining the temperature between the limits of 25° and 34° C., care being taken not to allow moisture to collect in drops either on the leaves or on the fruit, which is also attacked by the organism. A lowering of the temperature below 25° is only permissible for very short periods, e.g., during intensive harvesting of the cucumbers in the hothouse. High temperatures do not affect adversely the health of the cucumber plant.

NISIKADO (Y.) & YAMAUTI (K.). **On the spore germination and the pure culture of Armillaria matsutake Imo et Imai, the most important edible Mushroom in Japan.**—*Ber. Ōhara Inst.*, vii, 2, pp. 273–288, 4 pl., 1936.

Germination of the basidiospores of *Armillaria matsutake*, the principal edible mushroom of Japan [*R.A.M.*, xv, p. 72], took place in the writers' experiments on pine forest soil decoction agar, with or without 2 per cent. glucose, and malt extract agar. The most favourable hydrogen-ion concentration for the process was found to lie between P_H 4 and 6, the optimum temperature between 24° C., with minima and maxima at 10° to 15° and 26° to 29°, respectively. The mycelium of the fungus made satisfactory but very slow growth on the above-mentioned soil decoction agar, Knop's agar, Sachs's agar with glucose, and Hopkins's agar, the minimum, optimum, and maximum temperatures for its development being 5°, 24°, and 30° to 32°, respectively. Clamp-connexions were observed in vegetations arising from more than two basidiospores.

UPPAL (B. N.), KAMAT (M. N.), & PATEL (M. K.). **A new variety of Oidiopsis taurica.**—*Indian J. agric. Sci.*, vi, 1, pp. 110–115, 1 pl., 1 graph, 1936.

In 1933 a fungus generally resembling *Oidiopsis taurica* [*R.A.M.*, xiv, pp. 83, 146, 561] was found causing a powdery mildew of one or two vines only of *Dolichos lablab* at Poona. The upper leaf surfaces bore dull red, irregular spots, delimited by the veins, and the under sides white patches of mildew of corresponding extent; defoliation of the affected plants ensued. The organism was found to differ from *O. taurica* in its much longer spores (47 to 111 compared with 32 to 82 μ) and is accordingly named [with an English diagnosis] *O. taurica* var. *macrospora*. A high degree of specialization on the part of *O. taurica* and the new variety was revealed by the results of cross-inoculation experiments with the former from *Cyamopsis psoraloides*, *Oxalis corniculata*, and *Euphorbia geniculata*, and with the latter from *D. lablab*, all the forms being strictly confined to their own hosts.

LAFFOND (P.). **Les principaux ennemis du vignoble algérien en 1935.** [The chief enemies of Algerian vineyards in 1935.]—*Progr. agric. vitic.*, cv, 3, pp. 63–67, 1936.

Brief notes are given on the development in 1935 of the more important diseases and pests of the vine in Algeria. Owing to warm and wet summer conditions in certain regions, downy mildew (*Plasmopara viticola*) is stated to have caused the loss of 20 to 30 per cent. of the crop in the more heavily infected vineyards. In the other regions the chief damage to the vine was done by *Oidium* (*Uncinula necator*); in the littoral zone, in particular, the grape crop was rescued from total loss only by spraying with a solution of 125 gm. potassium permanganate in 100 l. water, followed immediately after by dusting with sulphur. Cases of court-noué [*R.A.M.*, xv, p. 199] were found in the very sandy soils in the vicinity of Algiers, showing the presence in some of the infected material of a sparse and very fine mycelium, which may eventually prove to belong to *Pumilus medullae* [ibid., xiv, p. 675].

Biron (M.). **Excoriose et poudrages cupriques.** [Excoriosis and cupric dusts.]—*Rev. Vitic., Paris*, lxxxiv, 2168, pp. 42–45, 1936.

The author gives a brief popular account of excoriosis of the vine (*Phoma flaccida*) [*R.A.M.*, xiv, p. 675], and states that a measure of control of the disease may be obtained by avoiding over-moist soils for planting and by liberal application to the soil, especially after one or two heavy harvests, of phosphoric acid and potash fertilizers to induce early lignification of the new shoots. He also recommends at least one application to the vinestocks after pruning of a spray containing alkaline naphtho-arsenites or paraffin oil, or swabbing the stocks with 10 per cent. sulphuric acid or with a 1 or 2 per cent. solution plus 30 per cent. iron sulphate. The best control, however, is given by dusting the vines during vegetation with finely divided and adherent cupric dusts, special care being taken to apply the dust to the bases of the new shoots that develop during the season.

Beaumont (A.) & Staniland (L. N.). **Twelfth Annual Report of the Department of Plant Pathology, Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1935.**—32 pp., 1936.

In this report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiv, p. 676], it is stated that in 1935 approximately similar results were obtained in forecasting outbreaks of potato blight [*Phytophthora infestans*: *R.A.M.*, xv, p. 522] by applying the two days' high humidity rule as by determinations based on other favourable factors (dew, minimum temperature of 50° F., under 5 hours' sunshine, at least 0·01 in. rainfall, relative humidity not under 75 per cent. at 3 p.m.). The evidence showed that infection follows a period of high humidity only if the temperature is high enough, temperature being one of the most important limiting factors governing blight outbreaks.

Of five antirrhinum varieties grown at Seale-Hayne two showed about 70 per cent. rust [*Puccinia antirrhini*: ibid., xv, p. 442, and below, p. 559], while the resistant varieties had only 5 to 30 per cent. infection; the development of resistant varieties would therefore appear to be a promising method of control.

In notes on a large number of fungi capable of rotting apples and pears it is stated that bitter rot (*Gloeosporium fructigenum*) [*Glomerella cingulata*: ibid., xiv, pp. 40, 596] occurs very frequently, but not often abundantly. A very similar and equally common form is caused by *G. album* [ibid., vi, p. 527] with pale spore masses, but microscopic examination is necessary for identification. Eye rot (*Nectria galligena*) [ibid., xiii, p. 584] is very common on pears but rare on apples in Devon and Cornwall. *Phytophthora cactorum* [ibid., xiv, p. 371] is very frequent in the early autumn on apples and pears both on the tree and in storage. Storage rots included *Rhizopus nigricans* [ibid., xiii, p. 523] on pears and *Diaporthe perniciosa* [ibid., xiv, p. 771] on apples.

Small (T.). **Report of the Mycologist.**—*Rapp. aux États de Jersey, 1935*, pp. 27–43, 1936.

This report contains, among others, the following items of phyto-

pathological interest. Potato blight (*Phytophthora infestans*) [*R.A.M.*, xiv, p. 492; xv, p. 45] appeared in many fields in Jersey early in June, 1935, and owing to the neglect of control measures became widespread and severe in certain areas. In future the inspection of the potato crop should be begun earlier in order that all the growers may be visited and no unfit produce exported; many fields would have been saved by prompt inspection and the postponement of digging. Scorching the haulms with oil of vitriol (sp.g. 1·70) gave far better control than the same practice using copper sulphate. Cutting the haulms is a cheap and reliable control method, but should not be resorted to when the disease is actively present on them. Infection was present on numerous volunteer potatoes outdoors in January and February, and was first reported on the new outdoor crop on 24th April.

Pink rot (*P. erythroseptica*) [ibid., xiv, p. 180] was noted for the first time in Jersey in 1935. *Sclerotinia sclerotiorum* was prevalent on potatoes and also occurred on tomatoes in the autumn, infection probably being favoured by a wet season.

Bruce turnips and Wilhelmsburger swedes were resistant to *Plasmodiophora brassicae* [ibid., xiv, p. 493 and above, p. 547].

SAREJANNI (J. A.). **Liste 1 des maladies des plantes cultivées et autres de la Grèce.** [List 1 of diseases of cultivated and other plants of Greece.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 2, pp. 13–20, 1935. [Received July, 1936.]

A list is given of some well-known fungal and bacterial diseases affecting cereal, fruit, vegetable, and miscellaneous crops, trees, vines, ornamentals, and weeds in Greece [see next abstract]. The material on which the records are based was examined at the Benaki Phytopathological Institute from 1931 to 1933.

SAREJANNI (J. A.). **Notes phytopathologiques.** [Phytopathological notes.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 67–76, 1 fig., 1935. [Received July, 1936.]

In June, 1934, over half the tomato plants growing in fields near Lake Janina, Greece, were severely affected by a form of leaf roll, in which the leaves on the lower branches showed a pale green under surface, and were thickened, in some cases deformed, and invariably stiff and very brittle. The affected branches rapidly dry up as the disease spreads up the plant, killing the leaves and branches as it goes. By July the plants are completely withered, practically none of the fruits having matured. The disease appears every year at Janina towards the end of May and has also been observed near Athens; the cause has not yet been ascertained.

Leaves of *Pistacia vera* from various parts of Greece and the neighbouring islands frequently bore the pycnidia of *Septoria pistacina* Allescher [*R.A.M.*, viii, p. 339], some of the stylospores reaching 70 μ in length. The author suggests that Allescher's creation of a separate species because the stylospores of *S. pistaciae* measured only 20 μ in length (as against 50 μ for *S. pistacina*) may not be well founded, the different measurements simply indicating pycnospores of the same

species but at different stages of maturity. Infections occur annually in spring and autumn. The former sometimes causes heavy losses unless Bordeaux mixture is applied as a preventive measure.

A grey rot of vine floral buds, which coincided with the onset of damp, cold weather and became arrested when the weather improved, was invariably associated with *Botrytis cinerea*; the condition was frequently accompanied by a leaf rot apparently identical with the leaf scorch described by Ravaz [ibid., vi, p. 595] in association with grey rot.

During February and March almond leaves in Crete show the orange spots produced by *Polystigma ochraceum* [ibid., xiv, p. 429]; no damage is caused either here or in Attica, but very heavy losses are caused by the same fungus in Chios, where the cultural conditions are unsatisfactory. In 1933, apricot leaves at Kiphissia were covered with the perithecia of *Podosphaera* [*oxyacanthae* var.] *tridactyla* [ibid., v, p. 699]. The perithecia of *Uncinula necator* were found on vine leaves, probably their first record in Greece.

Saintpaulia ionantha plants were infected by a *Phytophthora* resembling *P. cactorum*. *Spartium junceum* at Kiphissia is gradually disappearing as a result of infection by a *Microsphaera* resembling *M. bäumleri* and *Trichocladia bäumleri* which destroys the young branches, floral buds, and young leaves.

Mitra (M.). **Report of the Imperial Mycologist.**—*Sci. Rep. agric. Res. Inst. Pusa, 1933–34*, pp. 139–167, 1936.

The P. 113, P. 114, P. 111, and Punjab 8A wheat varieties grown at Karnal showed, respectively, 0·49, 0, 0·49, and 24·2 per cent. infection by *Ustilago tritici*; Pusa 114 was unaffected, and appeared to be highly resistant. In 1931–2 orange rust (*Puccinia triticina*), yellow rust (*P. glumarum*), and black rust (*P. graminis*) appeared on wheat at Pusa on 26th December, 16th January, and 5th February, respectively, the corresponding dates for 1932–3 being 29th December, 3rd February, and 13th February, and for 1933–4 being 20th December, 19th January, and 7th February. Barley seed treated with ceresan and uspulun in a small-scale test gave plants free from *U. hordei*, plots from seed treated with formalin and from untreated seed showing 0·5 and 6 per cent. infection, respectively.

An apparently new species of *Cercospora* forming spots on the stem and pod of sann-hemp [*Crotalaria juncea*] was common at Pusa and its pathogenicity proved. A detailed study of a *Cercospora* parasitic on the leaf, stem, and pod of *Glycine hispida* showed that it did not agree with *C. daizu* [ibid., xiii, p. 490]. All the locally grown varieties were susceptible. The disease appears to be seed-borne.

Infection of gram [*Cicer arietinum*] by a *Mystrosporium* [ibid., xi, p. 425] was very severe on Type 68 and moderately so on Types 48, 49, and 67; on 18 types the attack was slight, and on 34 only a trace of blight was present.

'Phurki' disease of cardamom [*Amomum subulatum*] has rendered the cultivation of this crop almost impossible in the Darjeeling district. In some of the affected roots a *Cephalosporium* of as yet unknown significance was present.

A vine leaf spot due to a fungus resembling a *Guignardia* was very common at Pusa.

Cercospora tageticola was noted for the first time infecting the leaf stems and inflorescences of *Tagetes patula*. The disease, which was epidemic, was carried from diseased to healthy flowers by bees. Other new records included *Phytophthora parasitica* var. *nicotianae* on tobacco stems and roots and *Ceratostomella paradoxa* (in culture from the conidial stage) and *Sclerotium rolfsii* on sugar-cane [ibid., xiv, p. 470; xv, p. 465].

In the second part of this report (by S. V. Desai) it is stated that sugar-cane mosaic was transmitted to sorghum, *Euchlaena mexicana*, and maize by infecting them with the juice of sugar-cane mosaic leaves, but the reverse transmission to sugar-cane was not found possible [ibid., ix, p. 724; cf. also xv, p. 528]. At Pusa virulence, which varies with the climatic conditions, is sufficient for artificial transmission from 15th March to 15th June only.

McDonald (J.). **Annual Report of the Senior Mycologist.**—*Rep. Dep. Agric. Kenya, 1934*, ii, pp. 24–39, 1936.

In addition to the work already noticed from Part I of this report [*R.A.M.*, xv, p. 482] the following items are of interest. There were indications that a different physiologic form of wheat yellow rust (*Puccinia glumarum*) was present in Kenya in 1934 from that found in 1933 [ibid., xiv, p. 427]. Leaf spot (*Septoria tritici*) [ibid., xi, p. 745] was recorded at Molo for the first time in Kenya. From a minor but fairly common disease of maize seed taking the form of a dark brown discoloration (sometimes appearing as striations) near the germ end, just outside the portion inserted into the scaly tissues of the core, and apparently confined to the seed coat, a *Penicillium* allied to *P. pinophilum* [ibid., xi, p. 717] was isolated. Ear rot of maize (*Diplodia zeae*), previously uncommon and unimportant in Kenya, was rather prevalent [ibid., xi, p. 159].

In a test for the control of barley covered smut (*Ustilago hordei*) seed-dusting with agrosan G and abavit B gave 0·21 and 0·65 per cent. smutted heads, respectively, as compared with 2·18 per cent. in the untreated plot [ibid., xiii, pp. 570, 625]. Sorghum grown from seed treated with granosan [ibid., xiv, p. 809] averaged 1·2 per cent. smut (*Sphacelotheca sorghi*) [ibid., xiii, p. 648; xiv, p. 574] as against 55·6 per cent. for the untreated, the yield of clean grain being at the rate of 2,786 lb. and 1,624 lb. per acre, respectively.

Linseed stem-break (*Polyspora lini*) [ibid., xv, p. 441], not recorded in Kenya for some years, occurred in a severe form on the Bison variety at Njoro, 43 per cent. of the plants being affected; among other varieties Bullmoose showed 4 per cent. and Persian Gulf about 0·25 per cent. infection, while Redwing, Rio, Ottawa 770 B, Morocco, and La Plata were unaffected.

New records made included *Gibberella fujikuroi* var. *subglutinans* [ibid., xv, p. 359] and *Colletotrichum graminicolum* on maize [ibid., xv, p. 494], *Helminthosporium gramineum* on barley [ibid., xiv, p. 433; xv, p. 48], and *Ascochyta pisi* on *Vicia faba* [ibid., xiii, p. 670]. The following wood-rotting fungi were also recorded: *Stereum bicolor*, *S. cinerascens*, and *Sarcoxylon aurantiacum*.

Russell (T. A.). **Plant pathological Report, 1935.**—*Rep. Bd Agric. Bermuda, 1935*, pp. 18–23, 1936.

This report [cf. *R.A.M.*, xiv, p. 559] contains the following items of phytopathological interest, apart from those already noticed from other sources. Carrots with the tops and outside leaves rotted by *Sclerotinia sclerotiorum* [ibid., xiii, p. 356] showed no infection of the roots when dug, but after a few days the fungus spread to them either through the crown or from rotted leaves in contact with them. Celery stored at 36° F. rapidly rotted away as a result of infection by *S. sclerotiorum*; care must be taken before placing celery in cool storage to see that it is free from the fungus.

The chief diseases of Easter lilies [*Lilium longiflorum* var. *eximium*] were rosette or 'yellow flat' [ibid., xiii, p. 165; xiv, p. 153] and stump rot (*Phytophthora parasitica*) [ibid., x, p. 667]. The fruiting of lime trees [*Citrus medica*] was impaired as a result of infection by *Gloeosporium limetticolum* [ibid., xiv, p. 84]. Antirrhinums showed a leaf-blight and die-back associated with *Phyllosticta antirrhini* [ibid., xi, p. 745] and in many gardens were affected by rust (*Puccinia antirrhini*) [see above, p. 555]. Crown rot of *Gerbera* plants was caused by *S. sclerotiorum*. Roses were widely affected, some varieties severely, by *Diplocarpon rosae* [ibid., xiv, p. 313].

Forty-eighth Annual Report of the Colorado Agricultural Experiment Station for the fiscal year 1934–1935.—36 pp., 1935. [Received June, 1936.]

The following items of phytopathological interest occur in this report. In an attempt to arrest the spread of peach mosaic [*R.A.M.*, xiv, p. 222], 20,000 trees have been eradicated. Budding and grafting experiments demonstrated the virus origin of the disease and its spread from tree to tree by these operations.

Satisfactory progress has been made in the development of a tipburn-resistant variety of head lettuce [ibid., xiii, pp. 496, 560]. Bacterial wilt of lucerne [*Aplanobacter insidiosum*: ibid., xiv, p. 682] is stated to be widespread on the Eastern Slope. Affected stands do not usually live more than three years, but during the last five years Hardistan, a strain of Turkestan lucerne, has persisted two years longer in field tests than Baltic, Grimm, or Common [ibid., xiv, p. 222]. Its yield, however, was some one-fifth less during the first three years than that of the superior Baltic and Grimm strains.

Lyon (H. L.). **Botany, forestry and pathology.**—*Rep. Hawaii. Sug. Exp. Sta. 1935* (*ex Proc. Hawaii. Sug. Pl. Ass., 1935*), pp. 26–37, 1936.

This report [cf. *R.A.M.*, xiv, p. 530] contains the following items of phytopathological interest. C. W. Carpenter states that powdery scab (*Spongospora subterranea*) [ibid., xv, p. 393] of Irish potatoes was identified apparently for the first time in Hawaii, where it is thought to be even less important than common scab (*Actinomyces scabies*). Dry rot (*Diaporthe batatatis*) [*D. phaseolorum* var. *batatatis*: ibid., xv, p. 277] was found on Tahitian sweet potatoes at Manoa.

J. P. Martin observed leaf scald [*Bacterium albilineans*: ibid., xv, p. 346] for the first time at Waiakea on the stalks of Yellow Caledonia sugar-cane weakened by lightning injury. In regions where the disease is of major importance the most effective control of leaf scald is obtained by planting resistant varieties. The disease may appear to be insignificant, or may even remain unrecognized for a long time when the symptoms have disappeared, while tolerant varieties may possibly carry infection indefinitely. The variety 29–3859 outyielded crop cane in tests on several plantations along the Hilo Coast in spite of scattered stools affected with leaf scald.

When H 109 sugar-cane plants were grown (by J. P. Martin) in nutrient solutions (i) lacking, (ii) containing an excess, of one of the following elements: nitrogen, potassium, phosphorus, calcium, magnesium, sulphur, or manganese and were sprayed with spores of the eye-spot fungus [*Helminthosporium ocellum*: see below, p. 606] varying degrees of infection resulted, the least in the minus nitrogen and minus calcium series.

Experiments in co-operation with R. J. Borden showed a definite response of Sudan grass (*Andropogon sorghum* var. *sudanensis*) [*Sorghum sudanense*] grown in Hamakua soil to calcium applications. It is believed that both phosphorus and calcium function partly by increasing the resistance of the roots to *Pythium* [*graminicolum*: ibid., xv, p. 465]. The addition of pure cultures of the fungus to Sudan grass and sugar-cane growing normally in pots with only moderate applications of superphosphate, nitrogen, and potash resulted in depressed growth.

HURTADO (E. A.). **A survey of the plant diseases in Maridagao, Pikit, Cotabato, with some suggestions for their control.**—*Philipp. J. Agric.*, vii, 1, pp. 121–127, 6 pl., 1936.

Semi-popular notes are given on some cacao, coffee, rubber, and citrus diseases, including die-back (*Gloeosporium* sp.) and black rot (*Fusarium* sp.) of the first-named [*R.A.M.*, xiv, p. 567], observed at the Maridagao (Philippines) Rubber Experiment Station in 1934, with general recommendations for their control.

LEVINE (M.). **Studies on Bacterium tumefaciens in culture media.**—*Amer. J. Bot.*, xxiii, 3, pp. 191–198, 3 figs., 1936.

Daily smears from a culture of *Bacterium tumefaciens* (hop strain) showed that the organism undergoes morphological changes, probably induced by the diminution of the nutritive content of the media combined with an increase in the katabolic products of the bacterium [*R.A.M.*, v, p. 216; xi, p. 357]. Such changes are not true mutations, since they do not perpetuate themselves, but rather represent phases in the life-cycle of the organism. The organisms from old cultures consistently assume on transference to fresh media the rod forms typifying the 'embryonic' stage of the species. Variations in the virulence of individual cultures of the organism were observed.

Bact. tumefaciens appears capable of resisting adverse conditions, such as intensive desiccation and exposure to light. In the early stages of development it can survive temperatures of about 50° C., and the thermal death point for older cultures may be even higher. The spore-

like bodies constantly observed in old cultures appear to represent a morphological adaptation of the organism to the unfavourable influences of desiccation, light, and possibly heat. This facility of adjustment to the environment may explain the capacity of *Bact. tumefaciens* and other bacterial plant pathogens to overwinter and exist in the soil for periods of over a year [ibid., xiii, p. 786]. Microscopic studies of Siegler's apple woolly knot organism [ibid., viii, p. 249; cf. also x, pp. 166 et seq.] showed its cultural characters to be quite distinct from those of *Bact. tumefaciens*, while in laboratory tests it produced only small excrescences on rose, geranium [*Pelargonium*], rubber, willow, *Bryophyllum*, apple, and other plants.

SMITH (C. O.). **Crown gall on Araucaria bidwillii.**—*Phytopathology*, xxvi, 4, pp. 400–401, 1 fig., 1936.

Pseudomonas [*Bacterium*] *tumefaciens*, isolated from peach, is stated to have been successfully inoculated into *Araucaria bidwillii* in California [cf. *R.A.M.*, xiv, p. 566], producing subspherical galls, 5 to 30 mm. in diameter, the smooth surface of which sometimes showed characteristic sculpturing in the shape of small, regular, angular, brownish areas, probably due to unequal growth and tension in the tissue. Positive results were obtained only when the inoculations were made between January and April.

POUND (F. J.). **Studies of fruitfulness in Cacao.**—*Rep. Cacao Res., Trin., 1935*, pp. 16–19, 1936.

The record of badly blackened cacao pods resulting from infection by *Phytophthora palmivora* [*R.A.M.*, xiv, pp. 217, 566] in Trinidad in 1933–4 showed that potash had a restraining influence on the incidence of the disease, this effect being significant in the interaction of potash with phosphate though not in the main treatment analysis. Phosphate alone had no effect, but in combination with potash destroyed the beneficial effect of the latter.

PARODI (E.). **Sulle cause della decadenza della cultura del Cacao all' Ecuador e possibili remedi.** [On the causes of the decline of Cacao cultivation in Ecuador and possible remedies.]—*Agron. colon.*, xxx, 4, pp. 121–127, 5 figs., 1936.

Cacao production in Ecuador, which reached a maximum in 1920, has of recent years suffered a sensational decline as a result of witches' broom (*Marasmius perniciosus*) [*R.A.M.*, xiv, p. 430; xv, p. 202] and moniliasis (*Monilia roreri*) [ibid., xiii, p. 360], the available information on the effects and control of which is presented in a popular form. [A summary of this paper appears in *Riv. pat. veg.*, xxvi, p. 176, 1936.]

NEATBY (K. W.). **Factor relations in Wheat for resistance to Puccinia graminis tritici, Puccinia glumarum and Erysiphe graminis.**—*Phytopathology*, xxvi, 4, pp. 360–374, 1936.

All the data on *Puccinia graminis* presented in this tabulated account were obtained at Winnipeg, Canada, in 1929 and 1930 and have already been summarized from another source [*R.A.M.*, xii, p. 750]; the

remainder of the investigations was carried out at Cambridge, England, during 1933–4.

In the cross H–44–24 × Marquis the seedling reaction to *P. glumarum* was found to be closely associated with mature plant reaction to *P. graminis* [ibid., xiv, p. 226; xv, pp. 351, 429, 430]. In the group of lines with mature plant resistance to *P. graminis* all those susceptible to *Erysiphe graminis* [ibid., xiv, pp. 88, 224, 229, 711] were resistant or moderately so to *P. graminis* form 36, and all susceptible or semi-resistant to the latter were resistant to *E. graminis*.

In Marquillo × H–44–24 semi-resistance to *P. glumarum* was found to be associated with the mature plant resistance of H–44–24 to *P. graminis*. Resistance in the seedling stage to form 52 of *P. graminis* was correlated with susceptibility to *P. glumarum*, and conversely, susceptibility to form 52 involved resistance to *P. glumarum*.

In Garnet × Double Cross the relationship between the seedling reactions to *P. graminis* form 35 and *P. glumarum* was similar to that operating in Marquillo × H–44–24 in respect of *P. graminis* form 52 and *P. glumarum*. Susceptibility to *P. graminis* form 21 was associated with red pigmentation of the straw.

Pleiotropism in the particular genes concerned in the relationships herein described is considered to afford a more plausible explanation of their development than genetic linkage.

NAOUMOVA (Mme N. A.). Влияние температуры и влажности воздуха на инкубационный период **Puccinia triticina.** [The influence of temperature and humidity of the air on the incubation period of *Puccinia triticina*.]—*Pl. Prot. Leningr.*, *1935*, 5, pp. 33–55, 1 diag., 5 graphs, 1935. [English summary. Received May, 1936.]

A tabulated account is given of the preliminary results of greenhouse experiments from 1932 to 1934, inclusive, in Leningrad, which showed that the optimum temperature for infection of spring wheat (Lutescens 062) with brown rust (*Puccinia triticina* form 13) and for the development of the rust pustules was about 25° C., with a maximum at about 30° (the lowest temperature tested was 15°). No infection resulted on inoculated leaves kept at 35° for six hours or more, even when the temperature was subsequently allowed to fall, and this temperature interrupted the development of the pustules which, however, resumed their growth after the temperature was lowered. Day temperature fluctuations between 15·6° and 23·6°, and between 18° and 29°, did not appreciably affect the growth of the intramatrical mycelium, but temperatures above 30° acting for several consecutive hours significantly lengthened the incubation period; this was observed to vary from 4 to 14 days within certain ranges of temperature. The development of the internal mycelium appeared to be stimulated by sharp fluctuations of the day temperature between 35° and 55°, associated with low night minima. Relative atmospheric humidity did not apparently affect the length of the incubation period.

The investigations indicated that the length of the incubation period of *P. triticina* is inversely proportional to the total minimum, mean, and maximum temperatures for the three days following infection. It was demonstrated that a nomogram [*R.A.M.*, xv, p. 523] may also be con-

structed for the determination of the length of the brown rust incubation period in the Leningrad region, according to the temperatures observed.

SHAW (F. J. F.) & PAL (B. P.). **Pusa 120 : a Wheat highly resistant to yellow rust.**—*Agric. Live-Stk India*, vi, 2, pp. 202–203, 1936.

Pusa 120, one of the new Pusa wheats selected from the progeny of a cross between Pusa 52 and the Australian variety Federation, has been found in greenhouse tests by [K. C.] Mehta to possess a very high degree of resistance to the three physiologic forms of yellow rust [*Puccinia glumarum*] hitherto encountered in India [*R.A.M.*, viii, p. 489]. Considerable resistance to yellow rust in the field has also been manifested by P. 165, a strain derived from a cross between P. 4 and Federation.

PETIT (A.). **Le charbon du Blé. Biologie—moyens de lutte.** [Loose smut of Wheat. Biology—means of control.]—16 pp., Tunis, Imprimerie Gorsse, Bascone & Muscat, 1936.

The author points out that the state of contamination of wheat seed by loose smut (*Ustilago tritici*) is not necessarily any indication of the amount of infection that will later develop in the crop. The only practical means of ascertaining whether wheat seed is heavily smutted is to sow a sample directly it is harvested and observe the earing that results, which will indicate the sanitary condition of the seed. As the disease is now general on the widely cultivated Florence × Aurore wheat in Tunisia the following steps should be taken at once.

A careful watch must be kept on all fields intended for seed production. No seed from any plot with over 1 to 2 per cent. smutted ears must be sown. On each farm about 0·1 to 0·5 per cent. of the seed harvested must be treated by immersion in water at 25° to 30° C. for 4 to 5 hours, followed by immersion for 10 minutes in water, the initial temperature of which is 53·5° to 54°, which should not be allowed to fall below 51·5° after the seed is poured in. The seed must then be very rapidly dried in air and treated with copper carbonate (250 gm. per quintal). Any smutted ears found in the plants grown must be removed and the clean seed so obtained again grown in order to obtain a sufficient quantity for future sowing.

SCHLEHUBER (A. M.). **Can different degrees of bunt resistance be recognized in F_2 plants?**—*J. Amer. Soc. Agron.*, xxviii, 4, pp. 266–270, 1 graph, 1936.

Data are discussed and tabulated showing definitely that different degrees of resistance to bunt [*Tilletia caries*] can be recognized in F_2 plants of crosses between Oro and Hybrid 128 and White Odessa and Turkey-Florence wheats in Washington [*R.A.M.*, xv, p. 344]. The practical application of this fact is readily apparent. For instance, when bunt-free and 20 per cent. bunted F_2 plants are selected from a cross of this type, it is possible to obtain F_3 families with a higher degree of resistance than either parent, whereas the progeny resulting from crossing 50 and 80 per cent. F_2 individuals is not even as resistant as the

resistant parent. Bunt-free F_2 plants yielded five times as many resistant F_3 families as did the 20 per cent. bunted group.

Bryzgalova (Mme V.). Испытание противоголовневых фунгисидов в условиях лесостепной зоны Восточной Сибири. [Tests of fungicides for the control of cereal smuts in the forest-steppe zone of East Siberia.]—*Pl. Prot. Leningr.*, *1935*, 3, pp. 67–72, 1935. [Received May, 1936.]

After stating that in the forest-steppe zone of east Siberia all cereal crops, except rye, are more or less severely attacked by smut fungi, among which wheat bunt [*Tilletia caries* and *T. foetens*] is economically the most important, the author gives a tabulated account of tests in 1934 of a number of old and new seed disinfectants manufactured in the U.S.S.R. for the control of these diseases. With heavily bunted spring wheat seed the best control was given by formalin (1 in 300). With moderately infected seed-grain the copper carbonate dust AB [*R.A.M.*, xiv, p. 22] containing 16 to 20 per cent. copper gave satisfactory control at the rate of 150 gm. per cwt. of grain, while 300 gm. of the dust containing 9 per cent. copper were necessary to give commercial control of bunt with slightly infected seed-grain. Among the new dusts which were tried, relatively good control was afforded by A–12, B–10, and B–12 [the constitution of which is not given], N-arsin (100 gm. per cwt.) coming next in efficacy. The three first-named dusts slightly depressed the viability of the seed. The best control of loose smut of oats [*Ustilago avenae*] was given by formalin (1 in 80), which completely suppressed the smut, while Russian-prepared germisan [ibid., xv, p. 519] gave only very slightly inferior control.

Aamodt (O. S.), Torrie (J. H.), & Takahashi (K.). **The effect of several collections of Tilletia tritici and T. levis on the morphology of spring Wheats.**—*Phytopathology*, xxvi, 4, pp. 344–359, 2 figs., 1936.

The effect of bunt on the morphology of the spring wheat plant was studied at the University of Alberta, Edmonton, on six varieties, Reward, Little Club, Pentad, Hope, Kota, and Garnet, inoculated separately with one collection of *Tilletia tritici* [*T. caries*] and four of *T. levis* [*T. foetens*]. The culm length was reduced to approximately the same extent by infection with either species [*R.A.M.*, xi, p. 502] but spike elongation of diseased heads [ibid., xii, p. 155] occurred only in the more susceptible varieties, Reward, Little Club, and Kota. The general shape of the bunt balls was determined more by the variety than by any inherent property in the fungus [ibid., xi, p. 565]. The bunt balls of the single collection of *T. caries* used in the tests tended to be smaller and rounder than those of *T. foetens* (*Phytopathology*, viii, p. 106, 1918), but in general no consistent correlation could be established between culm length, spike elongation, and bunt ball shape.

Neill (J. C.). **Experiments with two organic-mercury seed dusts.**—*N.Z. J. Agric.*, lii, 4, pp. 231–232, 1936.

In a test carried out in New Zealand naturally infected seed of Solid

Straw Tuscan wheat, Cape barley, and Algerian oats was dusted with agrosan G or ceresan U.T. 1875 (each at 2 oz. per bush.), a third portion being left untreated in each case. The agrosan G and ceresan U.T. 1875 reduced stinking smut of wheat [*Tilletia caries* and *T. foetens*] from 6·4 per cent. in the untreated plot to 0·06 and 0·04 per cent., respectively, the corresponding figures for barley covered smut [*Ustilago hordei*] being 0·33, 0, and 0 per cent., for oat smut [*U. kolleri* and *U. avenae*] 0·7, 0·15, and 0 per cent., and for stripe disease of oats [*Helminthosporium avenae*] 9·5, 1·9, and 0·01 per cent., respectively.

Perevesentzeva (Mme M. S.). Пятипроцентный арсенит магния как протравитель. [Five per cent. magnesium arsenite as a seed disinfectant.]—*Pl. Prot. Leningr.*, *1935*, 3, pp. 73–76, 1935. [Received May, 1936.]

The [tabulated] results of the experiments briefly reported in this paper showed that 5 per cent. magnesium arsenite-talc dust (containing 4·79 per cent. arsenious oxide), with the addition of 3 per cent. acidol as sticker, was more toxic in the laboratory to wheat bunt spores [*Tilletia caries* and *T. foetens*] and gave (at the rates of 1 and 0·75 gm. per 1 kg. seed) a slightly higher degree of field control of the disease than Davydoff's preparation [*R.A.M.*, xiv, p. 22] containing 9·03 per cent. arsenious oxide used at the same rates; the resulting percentages of bunted plants in the progeny of artificially infected Caesium 0111 spring wheat seed were 0·5 and 0·8 with magnesium arsenite, 0·8 and 1·1 with Davydoff's dust, and 30·7 in the untreated controls. Both dusts had a stimulating effect on the germinability of the infected seed-grain. In experiments with proso millet [*Panicum miliaceum*] artificially infected with smut [*Ustilago panici-miliacei*: ibid., xv, p. 432], magnesium arsenite-talc dust (1 gm. per 1 kg. grain) reduced the percentage of infection in the progeny from 61·8 in the control to 5·4, and Davydoff's dust (same rate) reduced it to 1·2.

Gorlenko (M. V.). Бактериоз колосьев яровой Пшеницы и его вредоносность. [Bacteriosis of the ears of spring Wheat and its injuriousness.]—*Pl. Prot. Leningr.*, *1935*, 3, pp. 82–85, 1935. [Received May, 1936.]

The spring wheat Caesium 0111 is stated to have been widely and severely affected in 1933 and 1934 in several localities of the government of Voronezh by a bacterial disease of the ear, characterized by a very conspicuous malformation and brown to black discoloration both of the glumes and awns; the diseased ears were shorter and contained more rudimentary grains and sterile spikelets than the healthy. In 1933, the yield of the affected ears was shown to have been reduced by as much as 91 per cent. of the normal, while in the drier 1934 year the reduction in yield was not over 50 per cent. The specific gravity of the harvested grain was also reduced by 18·4 per cent. in 1933. Isolations from diseased material consistently yielded a bacterium which, except for some minor differences, in culture produced colonies identical with those of *Bacterium translucens* [*R.A.M.*, xiv, p. 17], and is believed to be a variant of this organism. This is stated to be the first record of this bacterium on spring wheats in Russia.

Knokhrvakoff (M.). Малоизвестная болезнь озимых хлебов (склеротиния). [A little known disease of winter-sown cereals (*Sclerotinia*).] —*Pl. Prot. Leningr., 1935*, 4, pp. 94–97, 1935. [English summary. Received May, 1936.]

Following a severe outbreak of *Sclerotinia graminearum* [*R.A.M.*, v, p. 542] on winter-sown wheat and rye in the Gorki [formerly Nijni-Novgorod] region in 1934, which in many localities accounted for as much as 50 per cent. of the crops, the author gives a brief review of the information previously published on the disease in Russia. The trouble was first observed on a large scale in 1901 in the then Vyatka (now Kirov) region, since when it has been repeatedly recorded in the same region, as well as in other districts of Russia and the Ukraine, and in the Russian Far East. Observations show that it always appears in the spring, after the thawing of the snow, in the form of extensive patches of wilting plants, eventually involving the whole field. The disease somewhat resembles that caused by *Sclerotium rhizodes* [ibid., xiv, pp. 39, 766] but the latter only attacks the more mature plants. Spherical or elongated sclerotia, sometimes irregular or flattened, measuring 1·5 to 5 by 1 to 3 mm. in diameter, occur on and among the affected plants. On poorly fertilized, shallowly ploughed soil affected plants never recover, while on better cultivated and more fertile soils almost complete recovery may ensue. Clay and heavy soils are favourable to the disease, which usually occurs after abnormally wet and mild autumns, followed by similar winters, during which the snow cover persists late into the spring. Where crop rotation is not practicable the stubble of affected fields should be burnt and the remains deeply ploughed in, to prevent the germination of the sclerotia, before resowing with cereals. So far the fungus has not been observed to produce spores in nature, but it is believed highly probable that apothecia may develop from the sclerotia.

Fuchs (W. H.). **Die Getreidefusskrankheit im Gebiet von Halle.** [The cereal foot rot in the Halle district.]—*Kühn-Arch.*, xxxix, pp. 115–120, 1935.

Wheat foot rots in the Halle district of Germany, where they are responsible for substantial pecuniary losses, are stated to be mainly of the 'lodging' or 'straw-breaking' type, associated predominantly with *Cercosporella herpotrichoides* and *Fusarium* spp., chiefly *F. culmorum*, while a minor part is played by *Leptosphaeria herpotrichoides* [*R.A.M.*, xiii, p. 569; xiv, p. 351; xv, p. 85]; *Wojnowicia graminis*, which was present in 45 per cent. of the samples of stubble collected by F. Kauffert on a farm in the autumn of 1930, gave negative results in inoculation tests.

The 78 monospore lines of *L. herpotrichoides* were found in pure culture studies to fall into two groups, A (the more virulent) representing material supplied by Prof. Foëx and B that provided by the Centraalbureau voor Schimmelcultures, Baarn. Several strains of *F. culmorum* were also differentiated on the basis of variations in physiological and morphological characters and (to a slight extent) in pathogenicity. At 10° C. the damage caused by *F. nivale* [*Calonectria*

graminicola] (found, like *F. avenaceum*, in a few samples only) was much greater than that due to *F. culmorum*, whereas at 20° the positions were reversed [cf. ibid., x, p. 94; xii, p. 502].

In conformity with general experience, the writer's investigations showed the deleterious influence of summer barley as an immediate precursor of wheat in the rotation scheme. With potatoes the data were conflicting, while peas were not found to be suitable forerunners of wheat. Some reduction in the incidence of infection was obtained by soil treatments with lime, sulphuric acid, or iron sulphate, but the economic significance of direct control along these lines is regarded as dubious.

Moore (M. B.). **A method for inoculating Wheat and Barley with loose smuts.**—*Phytopathology*, xxvi, 4, pp. 397–400, 1 diag., 1936.

The apparatus described consists essentially of a glass inoculating chamber, which is placed over wheat and barley heads and secured by a split rubber stopper. By means of a foot pump attached by a tube to the top of the chamber an aqueous spore suspension of the loose smut [*Ustilago tritici* or *U. nuda*: *R.A.M.*, viii, p. 765], made up in the proportion of about two fair-sized smutted heads in 100 c.c. of water, is drawn into it and when the head is covered the pinch cock on the tube supplying the suspension is closed. A partial vacuum created by the action of the pump expands the air in the florets, and the returning pressure replaces it with the liquid inoculum. By this method it is possible to inoculate up to 30 heads per hour. Up to 100 per cent. infection was secured with *U. tritici*, the maximum for *U. nuda* being 76 per cent. (average 26·4 per cent.). The most favourable stage of development for inoculation by this method is just after anthesis in most of the florets and before the ovaries have more than doubled their original size.

Yu (T. F.). **Studies on stripe disease (Helminthosporium gramineum Rabh.) of Barley.**—*Agric. sinica*, i, 10, pp. 319–372, 4 figs., 1 graph, 1936. [Chinese, with English summary.]

A tabulated account is given of the results of ten years' studies on stripe disease of barley (*Helminthosporium gramineum*), which appears to be coextensive with the crop in China [*R.A.M.*, xiii, p. 24], causing an annual loss in the Kiangsu Province of 1·7 per cent. (computed on the basis of seven years' data).

In the diseased seeds the mycelium is found mostly between the pericarp and seed coat, being specially profuse near the embryonic region but not occurring in the embryo itself or penetrating deeper than the aleurone layer. Of the possible sources of infection, only mycelium hibernating in the seed-grain is of any practical importance. The conidia are too short-lived to cause infection of the second crop; no sclerotia or perithecia have been found in the field; and the inoculation of germinating seeds with diseased stubble gave negative results.

The best method of inoculation [ibid., xii, p. 161; xv, p. 288] is to spray the barley heads in the field with a spore suspension, equally good results being obtained at the milky or green mature stages or at any intervening period.

Liquid disinfectants have generally been found more efficacious than dusts in the control of *H. gramineum* [ibid., xiv, pp. 27, 28, 380; xv, p. 9], the best of the treatments tested under local conditions consisting of one to two hours' immersion of the seed-grain in 0·25 per cent. uspulun at room temperature. In a three-year trial of foreign and Chinese barleys for reaction to *H. gramineum*, a large number have remained free from infection.

A bibliography of 160 titles is appended.

HONECKER (L.). **Über den derzeitigen Stand und die Aussichten der Bekämpfung des Meltaubefalles der Gerste durch Züchtung.** [On the present status and prospects of the control of Barley mildew infection by breeding.]—*Prakt. Bl. Pflanzenb.*, xiii, 12, pp. 309–320, 1936.

Further observations are made on the position and prospects of barley mildew (*Erysiphe graminis*) [*hordei*] control by breeding in Germany [*R.A.M.*, xiv, p. 624], where the losses from this disease are stated to be steadily increasing of recent years. Infection is largely dependent on meteorological conditions and was greatly favoured in 1929, 1934, and 1935 by persistent drought in the spring and early summer months. At temperatures round about 20° C. the incubation period of the fungus is only four to five days, and two to three days later conidia are produced. The fungus overwinters in the conidial stage on volunteer plants and on the early sown winter crop, while the perithecia of the form of *E. graminis* on barley, in contrast to those of the wheat strain, appear to play little or no part in the spread of the disease.

During the period from 1921 to 1930, of which six years were favourable to more or less severe outbreaks of barley mildew in the Weihenstephan district of Bavaria, chemical analyses were made of the albumin content of the seed-grain of 43 susceptible brewing varieties compared with that of the fairly resistant Pflugs Intensiv. It was found that the average albumin content of the seed-grain of the susceptible varieties for the six mildew years was 12·15 per cent., the corresponding figure for Intensiv being 10·91 per cent.; in the remaining four years the percentages were 10·52 and 10·32 per cent., respectively. On the basis of experiments conducted throughout the country in 1934–5, the increase of yield associated with mildew resistance was estimated at roughly 10 per cent.

Five physiologic forms of *E. graminis* on barley have now been differentiated, viz., A, B, C (already referred to), D, and E. Of the two last-named, the former is an occasional concomitant of the widespread principal form A, while the latter (like C) was isolated only once. Form D appears to resemble B in its pathogenicity relations on test varieties, E being allied to C. For the present the following four varieties are recommended for the differentiation of physiologic forms (E being excluded) of *E. graminis hordei*: 4-rowed Hohenfinow (very susceptible to A, B, C, and D), Weihenstephan CP 127/422 (immune from A and D, very susceptible to B and C), Dalmatian Ragusa (immune from A and B, highly susceptible to C and D), and *Hordeum spontaneum nigrum* (immune from A, B, and D, and showing a mere

trace of infection by C). Form B seems to be on the increase in Baden and in the Palatinate.

The paper terminates with a discussion on the practical possibilities of selection of barley for resistance to the mildew.

Ryakhovski (N. A.). Испытание новых протравителей и уточнение дозировок фунгисидов при борьбе с головней Овса и Проса. [Testing new seed disinfectants and more accurate determination of the doses of fungicides used for the control of Oats and Millet smuts.]—*Pl. Prot. Leningr.*, *1935*, 3, pp. 77–79, 1935. [Received May, 1936.]

The results of experiments in 1934 in the government of Voronezh showed that steeping oat seed-grain inoculated with loose smut [*Ustilago avenae*] in a 1 in 300 formalin solution reduced smut infection in the progeny from 3·47 per cent. in the control to 0·12 per cent. The semi-dry treatment with 1 in 80 formalin only reduced the smut to 0·55 per cent., while weaker solutions gave even less satisfactory results, as well as the liquid treatment with 0·25 Soviet-prepared germisan [see above, p. 564]. Smut [*Ustilago panici miliacei*: see above, p. 565] of millet [*Panicum miliaceum*] was also best controlled by steeping the inoculated seed in 1 in 300 formalin (0·42 against 55·17 per cent. infection); dusting the seed with NIIF-arsin at the rate of 1 or 1·5 gm. per 1 kg. grain came next in efficacy (0·45 and 1·02 per cent.), and the semi-dry method with 1 in 80 formalin at the rate of 1·5 l. per cwt. of grain, reduced the percentage infection to 0·72. The other treatments tested did not prove satisfactory.

Pichler (F.). **Die Bekämpfung des Haferflugbrandes.** [The control of loose smut of Oats.]—*Neuheiten PflSch.*, xxix, 2, pp. 49–51, 1936.

Effective control of loose smut of oats [*Ustilago avenae*] was secured in experiments in Austria during 1934 and 1935 only by liquid disinfection of the seed-grain with 0·20 per cent. ceretan [ceresan] for 30 minutes, 0·25 per cent. formalin (15), 0·25 per cent. germisan (30), and 0·15 or 0·25 per cent. salvocer (60), all of which reduced the incidence of the disease from 14 per cent. to a trace, whereas the short disinfection process and dusting gave unsatisfactory results. Although the outcome of trials in 1934 to determine the influence of the sowing date on the amount of loose smut were not wholly conclusive, there was some indication that an improvement in the health of the stand may be effected by late spring (beginning to middle of May) planting.

Holton (C. S.). **Inheritance of chlamydospore characteristics in Oat smut fungi.**—*J. agric. Res.*, lii, 7, pp. 535–540, 1936.

The tabulated results of the tests briefly discussed in this paper showed that in crosses between *Ustilago levis* [*U. kolleri*] and the buff type of oat smut [*R.A.M.*, xv, p. 493] the factor for the production of brown chlamydospores is dominant, the distribution in the F_2 population of the brown and smooth, and of the hyaline and smooth chlamydospores being on a simple 3 : 1 basis. The same ratio also holds good for the distribution of the echinulate and smooth chlamydospores in F_2

populations of the hybrids between *U. avenae* and *U. kolleri*, the factor for echinulation being dominant. In crosses between *U. avenae* and the buff smut fungus the factors for echinulation and brownness are dominant over the factors for smoothness and hyalescence of the chlamydospores, the distribution in the F_2 populations of echinulate brown, smooth brown, and smooth hyaline spores being in the ratio 9 : 3 : 4. There was evidence indicating that echinulation in the hyaline chlamydospores of the buff smut is suppressed by the presence of an inhibitor.

Gorlenko (M. V.). К рационализации методов искоренения Слабительной Крушины. [On the rationalization of the methods for the eradication of Buckthorn.]—*Pl. Prot. Leningr.*, *1935*, 3, pp. 60–66, 1935. [Received May, 1936.]

A tabulated account is given of experiments in 1932 and 1933 in the region of Voronezh [south Russia], the results of which showed that *Rhamnus cathartica*, the alternate host of crown rust of oats [*Puccinia lolii*: *R.A.M.*, xv, p. 358 and next abstract] may be killed by the application of 2 per cent. sodium arsenate solution, a bush up to 2 m. high requiring 1 l., and larger bushes 2 l. Common salt heaped at the base of the bushes is equally efficient at the doses of 1 kg. and 2 kg., respectively. In using the liquid care should be taken to avoid spread-it over too wide a surface of the soil. It was further shown in 1934 that buckthorn bushes inside woods over 150 m. from the edge need not be eradicated, since the aecidiospores formed on them do not reach neighbouring oat fields.

Gorlenko (M. V.). Влияние агротехнических приемов на развитие корончатой ржавчины Овса. [The effect of agrotechnical methods on the development of crown rust of Oats.]—*Pl. Prot. Leningr.*, *1935*, 3, pp. 80–81, 1935. [Received May, 1936.]

The results of the field experiments in the government of Voronezh briefly discussed in this paper showed that both in a normal (1933) and in a weak rust year (1934) very early (28th March) and early (12th April) sowings of oats were very considerably less infected with crown rust [*Puccinia lolii*] (1·2 and 2·5 per cent. infection at milky maturity of the grain, respectively, in 1934) than average (20th April) and late (29th April) sowings in contiguous plots (4·2 and 15·6 per cent. respectively). Preliminary tests in 1934 tended to confirm Gassner's and Hassebrauk's findings regarding the rust-promoting effect of excessive nitrogen fertilizers [*R.A.M.*, xiii, p. 428]. Deep ploughing-under of oat stubble in the autumn or spring did not appear to reduce infection of buckthorn [*Rhamnus cathartica*: see preceding abstract] in the spring with crown rust, presumably because volunteer oats develop freely outside the oat fields, where they are difficult or impossible to suppress. All the standard oat varieties used in the south Russian black-earth belt were found to be equally susceptible to crown rust, but certain hybrids bred at the Voronezh Selection Centre, as well as the new pure line 0648 of the Tchakinskaya Cereal Station, and the Verkhnyatcheski pure line 053 in 1934 exhibited a high degree of resistance both to crown rust, and to stem rust [*Puccinia graminis*] and loose smut [*Ustilago avenae*].

Novotelnova (Mme N. S.). Некоторые наблюдения над условиями прорастания телейтоспор и базидиоспор **Puccinia graminis f. avenae** и уредоспор **Puccinia triticina.** [Some observations on the germination of the teleutospores and basidiospores of *Puccinia graminis* f. *avenae* and of the uredospores of *P. triticina.*]—*Pl. Prot. Leningr., 1935,* 4, pp. 98–106, 1935. [English summary. Received May, 1936.]

A summarized account is given of controlled experiments, the tabulated results of which showed that the teleutospores of *Puccinia graminis* f. *avenae* on oat straw kept over winter in an unheated glasshouse failed to germinate in the spring, while those on straw kept outdoors germinated freely. The minimum temperature for germination was between 9° and 12° C., the optimum 22°, and the maximum 30°. The spores were killed after 24 hours' exposure to 30°, but temperatures below the minimum did not affect their viability. No germination of the teleutospores occurred at relative humidities below 100 per cent. They germinated equally well both in daylight and in the dark. The basidiospores of the rust only germinated in water, and their temperature relations were: minimum 6° to 9°, optimum 17°, and maximum 27° to 30°.

The optimum temperature for the germination of *P. triticina* uredospores was 20° to 25°, with a minimum at 9° and a maximum a little above 30°. Wetting of the spores at the minimum and optimum temperatures stimulated, and at the maximum depressed their germination. The viability of uredospores that were dried after wetting was considerably reduced, high temperatures during drying accelerating the loss in germinability.

Murphy (H. C.). **Reaction of the Victoria Oat variety to crown rust.**—*Phytopathology,* xxvi, 4, pp. 396–397, 1936.

Attention is drawn to the occurrence within certain stocks of Victoria oats, normally highly resistant to crown rust (*Puccinia coronata avenae*) [*P. lolii*: *R.A.M.*, xv, p. 492] and smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) [ibid., xv, p. 493] of a few lines susceptible to the former disease and probably also to the latter, and breeders are recommended to use as parents only such pure-bred selections of the original variety as have undergone definite testing for their reactions to the fungi concerned. Although the resistance of Victoria to certain forms of *P. lolii* is not so complete as that of Bond (C.I. No. 2733), it nevertheless confers ample protection against the rust under ordinary field conditions.

Sprague (R.) & Johnson (A. G.). **A new Pseudodiscosia.**—*Mycologia,* xxviii, 2, pp. 181–185, 2 figs., 1936.

In 1932 a reddish-brown leaf spot was found on oats in Oregon, and more abundantly on the same host in Washington in 1934. The spots were of various shapes and sizes, and bore numerous conidia on very short conidiophores compacted together on a poorly developed stroma in the epidermis. The conidia germinated readily but invariably produced a very scanty growth, barely visible after six weeks, the mycelium

bearing conidia laterally, or terminally on short branches, in fan-shaped whorls. The fungus is regarded as a new species of *Pseudodiscosia* and is named *P. avenae*, with English and Latin diagnoses. The conidiophores are blunt or rarely sharply pointed, 5 to 12 by 0·8 to 2 μ. The conidia are narrowly fusiform, slightly curved, with one cilium at each end, hyaline or faintly yellow, 2 to 3 septate, and 10 to 42 by 2 to 4 μ, the basal cilium being rod-shaped or sometimes sharply pointed, 1 to 16 by 0·3 to 1·3 μ, attached obliquely near the hilum, and the apical cilium usually longer, very gradually merging with the body of the spore.

SPRAGUE (R.). **Leaf reddening in winter Oats in western Oregon.**—*Plant Dis. Reptr*, xx, 6, pp. 114–115, 1936. [Mimeographed.]

A vivid red coloration is sometimes shown by autumn- and early spring-sown oats [*R.A.M.*, xv, p. 356] in western Oregon, especially in poorly drained soils, to which, however, it is by no means confined. The anthocyanin pigment responsible for the condition appears to be an index of a disturbed metabolism associated with various factors. Excessive soil moisture and resultant decrease in oxygen supply to the roots, combined with increased soil acidity and a depleted stock of available nitrogen in late winter, may be combated by the application to the soil of 100 lb. powdered calcium cyanamide per acre. Unduly luxuriant top growth, promoted by a lengthy vegetative season, and low temperature injury to the chloroplasts are apt to induce reddening, much of which is also due to foot rot (*Fusarium culmorum*). The 'red leather leaf' disease (*Pseudodiscosia avenae*) [see preceding abstract] was found to be very prevalent in the Willamette Valley in March, 1936. The Grey Winter and Shadeland Eclipse oats are resistant to red leaf, whereas the non-hardy Victory and Schoolmam are very susceptible.

SMITH (F. L.). **The effect of Corn smut on the yield of grain in the San Joaquin Valley of California.**—*J. Amer. Soc. Agron.*, xxviii, 4, pp. 257–265, 1936.

Grain from 220 pairs of King Philip Hybrid maize plants attacked by smut (*Ustilago zeae*) in San Joaquin County, California, was weighed and analyses of the differences between this product and that of the same number of adjacent healthy plants analysed by Student's method (*Metron.*, v, p. 105, 1925). The losses due to the disease below the ear were estimated to be 7, 19, and 47 per cent. for small, medium, and large galls, respectively, the corresponding figures for the ear itself being 23, 41, and 82 per cent., respectively [*R.A.M.*, xiv, p. 750]. The percentage of barren stalks increased with the amount of smut, being 52 and 35, respectively, for large galls on and below the ear. No barren stalks were caused by single small galls or by medium-sized ones below the ear, but the latter on the ear resulted in 4 per cent. sterility. Multiple small and medium galls caused an increase in the percentage of barren stalks, which rose to 100 following infection by two or more large galls. The estimated loss in yield in a field with 17·4 per cent. smutted plants was 6 per cent.

STEVENS (N. E.). **Second experimental forecast of the incidence of bacterial wilt of Corn.**—*Plant Dis. Reptr*, xx, 6, pp. 109–113, 2 graphs, 2 maps, 1936. [Mimeographed.]

Assuming that winter temperature indices afford a comparatively reliable basis for predictions as to the extent and virulence of bacterial wilt of maize (*Aplanobacter stewarti*) [*R.A.M.*, xiv, p. 160; xv, p. 434], some reduction in the incidence of infection in Virginia and Maryland may be expected following the abnormally cold season of 1935–6, while in the Middle West, where the winter was of unprecedented severity, there should be a decided regression in the amount of the disease, a delay in its appearance, and an arrest of its northward progress. In New York and New England little change is to be anticipated.

POOS (F. W.) & ELLIOTT (CHARLOTTE). **Certain insect vectors of Aplanobacter stewarti.**—*J. agric. Res.*, lii, 8, pp. 585–608, 13 figs., 1936.

Continuing their studies on bacterial wilt (*Aplanobacter stewarti*) of maize in the United States [*R.A.M.*, xiv, pp. 94, 752], the authors give a tabulated account of investigations, carried out largely in 1934, the results of which confirmed the view that the disease is not transmitted through the soil. The wilt was transmitted directly from infected to healthy maize plants by the beetles, *Chaetocnema pulicaria*, *C. denticulata*, and *Diabrotica duodecimpunctata*; eight other species of insects which were collected on or near wilted maize plants yielded *A. stewarti* when tested for its presence. Of 908 adults of *C. pulicaria* collected from maize at Arlington Experiment Farm from May to September, 1934, an average of 40·3 per cent. yielded the parasite, which was also found to be present in an average of 12·1 per cent. of the adults of the same species collected from other host plants. The maximum proportion of isolations of *A. stewarti* obtained from this species was 75 per cent. Of 684 adults that were collected and tested just before hibernation, 13·1 per cent. yielded the organism.

Inoculations by needle and by *C. pulicaria* showed that teosinte (*Euchlaena mexicana*) [loc. cit.] and Job's tears (*Coix*) [*lacryma-jobi*] are also hosts of *A. stewarti*. The amount of bacterial wilt in eastern New York and in New England was much reduced in 1934, as compared with the two preceding years, following the low temperatures during the previous winter, indicating that winter temperatures may be very significant for the purpose of forecasting destructive outbreaks of the disease [see preceding abstract].

PASINETTI (L.). **Studio sulla 'batteriosi del Mais' da 'Aplanobacter stewarti' Smith osservata per la prima volta in Italia.** [A study on Maize bacteriosis caused by *Aplanobacter stewarti* Smith observed for the first time in Italy.]—*Riv. Pat. veg.*, xxvi, 3–4, pp. 61–84, 2 figs., 1936.

In the summer of 1935, maize of a local variety growing on a very compact soil in a damp, warm district near Milan showed 10 to 15 per cent. infection by *Aplanobacter stewarti* [see preceding abstract], this being the first record of the disease in Italy. Inoculations of maize

seedlings with pure cultures of the organism made in the collar by means of a syringe and in the leaves by needle prick gave slight infection on a few leaves only. The outbreak is considered to have been favoured by exceptional weather conditions prevailing over a limited area.

MÖLLER. **Beizt auch das Mais-Saatgut! Beobachtungen über die Wirkung von Ceresan (U.T. 1875a) auf Maiskeimlinge.** [Steep Maize seed-grain too! Observations on the action of ceresan (U.T. 1875a) on Maize seedlings.]—*Dtsch. landw. Pr.*, lxiii, 15, p. 184, 1936.

Encouraging results were given in the writer's laboratory experiments in the control of seed-borne fungi on maize, including *Gibberella saubinetii*, *Diplodia* [*zeae*], and *Basisporium* [*Nigrospora* sp.: *R.A.M.*, xiv, p. 751], by treatment with ceresan U.T. 1875a, and it is recommended that this precautionary measure should be widely practised in Germany.

FULLER (C. H. F.). **Micro-organisms in Breadmaking.**—*J. Soc. chem. Ind., Lond.*, lv, 14, pp. 93T–94T, 1936.

A brief review is given of recent developments in the control of bread spoilage by moulds (*Aspergillus*, *Penicillium*, *Mucor*, *Monilia*, and *Rhizopus* spp.) [*R.A.M.*, xiv, p. 691]. Attention is also drawn to proposals for the addition to the yeast, *Saccharomyces cerevisiae* [ibid., xiv, p. 383], commonly used in bread manufacture, of other micro-organisms with enzymatic properties such as *A. oryzae* [ibid., xiv, p. 784] or *Penicillium* (Arkady patent).

FAWCETT (H. S.). **Citrus diseases and their control.**—Second edition, xv+656 pp., 15 col. pl., 169 figs., 2 graphs, 1 map, New York and London, McGraw-Hill Book Company, Inc., 1936. Price 36*s*.

The author states in his preface to this second edition of his work (originally undertaken in collaboration with H. A. Lee, whose participation has since been withdrawn) on citrus diseases and their control [*R.A.M.*, v, p. 735] that the entire book has been thoroughly revised, most of the sections rewritten (in some cases with the help of specialists), and a number of new ones added. The latter include, *inter alia*, sections on 'mal secco' (*Deuterophoma tracheiphila*) [ibid., xv, p. 361], sweet orange fruit scab (*Sphaceloma fawcettii* var. *viscosa*) [ibid., xv, p. 362], Australian citrus scab (*S. fawcettii* var. *scabiosa*) [ibid., xv, p. 436], hard root rot (*Rhizoctonia lamellifera*) [ibid., xii, p. 727], *Macrophomina* root rot (*M. phaseoli*) [ibid., xiv, p. 670], cotton root rot (*Phymatotrichum omnivorum*) [ibid., x, p. 241], red root disease (*Sphaerostilbe repens*) [ibid., xii, p. 21], and little leaf [ibid., xiv, pp. 505, 768]. Psorosis, now regarded as a virus disease [ibid., xiii, p. 692], is discussed in full from this standpoint. A new chapter on diseases caused by deficiency and excess of inorganic constitutents [cf. ibid., xi, p. 570] is also added and a very complete bibliography (41 pp.) down to 1935 is appended. The edition forms a most valuable revision of this standard work and will no doubt prove indispensable to those engaged in the study of these diseases.

Bitancourt (A. A.) & Jenkins (Anna E.). **Elsinoe fawcetti, the perfect stage of the Citrus scab fungus.**—*Phytopathology*, xxvi, 4, pp. 393–395, 1 fig., 1936.

English and Latin diagnoses are furnished of *Elsinoe fawcetti* n. sp., the causal organism of scab lesions on Satsuma orange (*Citrus nobilis unshiu*) rind in San Paulo, Brazil. Although attempts to establish the genetic connexion of the fungus with *Sphaceloma fawcettii* [*R.A.M.*, xv, p. 436] by means of ascospore cultures failed, there is considered to be no doubt as to the relationship, since the injuries are typical of scab and the conidial stage (*S. fawcettii*) is present on the younger lesions of the specimens (on the leaves). The perfect stage, moreover, closely resembles those of other species of *Sphaceloma*, e.g., *E. ampelina* [ibid., xv, pp. 468, 477], *E. piri* [ibid., xiv, pp. 223, 815], and *E. phaseoli* [ibid., xiii, p. 345]. The globose to ovoid asci of *E. fawcetti*, of which 1 to 20 or more occur in a single pulvinate, dark brown, circular to elliptical ascoma, 38 to 106 by 36 to 80 μ, measure 12 to 16 μ in diameter and contain hyaline, oblong-elliptical, uni- to triseptate ascospores, 10 to 12 by 5 to 6 μ.

Sarejanni (J. A.). **Le 'mal secco' en Grèce.** ['Mal secco' in Greece.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 61–66, 1935. [Received July, 1936.]

Mal secco disease (*Deuterophoma tracheiphila*) [*R.A.M.*, xv, p. 361] causes considerable damage to lemon and citron trees in Greece. The author frequently isolated *D. tracheiphila* from citrons, lemons, and bitter oranges in all the localities where the disease was present, the chromogenic and non-chromogenic strains [ibid., x, p. 183] occurring together, one or the other predominating in different districts. The pycnidia, found from March to May in the Peloponnese and Crete, ranged from 34 to 104 μ in diameter, the spore measurements being 2·5 to 4 by 0·7 to 1·5 μ.

Other citrus diseases which may be confused with mal secco in Greece are: wither-tip (*Colletotrichum gloeosporioides*); gummosis of the collar due to a *Phytophthora*; leaf fall and branch desiccation caused by *Bacterium* [*Pseudomonas*] *citriputeale*; and the injuries due to frost, drought, or high winds.

An orchard of lemon trees grafted over 20 years ago on mandarin orange trees, themselves grafted on sour orange, has consistently shown marked resistance to infection.

Casella (D.). **Le malattie degli Agrumi e lo stato attuale dei rimedi relativi.** [Citrus diseases and the present status of the appropriate control measures.]—*Ann. Staz. Agrum. Frutt. Acireale*, N.S., ii, pp. 239–253, 1935. [Received April, 1936.]

Full practical notes designed to assist growers are given on the prevention and control by improved cultural and sanitary practices, chemical treatments, and the development of resistant varieties, of the following citrus diseases in Sicily: *Rhizoctonia* damping-off [*R.A.M.*, xv, p. 361], root rot and gummosis due to *Phytophthora citrophthora* and *P. parasitica* [ibid., xiii, p. 301; xiv, p. 505; xv, pp. 364, 541] and 'mal secco' (*Deuterophoma tracheiphila*) [see preceding abstract].

FAWCETT (H. S.), KLOTZ (L. J.), & NIXON (H. W.). **Effects of storage and holding conditions on Alternaria in Lemons.**—*Calif. Citrogr.*, xxi, 4, pp. 118, 143–144, 2 graphs, 1936.

In an experiment carried out in California in 1935 to ascertain the effect of different storage conditions on the development of *Alternaria* decay in lemons one lot of fruit was placed in the best obtainable conditions of natural ventilation and another comparable lot in air-conditioned refrigeration. After approximately six months' storage the lemons were submitted to the effects of different temperatures.

The data obtained [which are tabulated] showed that the refrigerated lemons (lot A) were superior in keeping quality to the others (lot B), representative samples of 100 fruits showing 33 and 59 per cent. indications of infection in lots A and B, respectively. In lot A 36 per cent. and in B only 5 per cent. of the lemons had green buttons. After two weeks' further storage at 36° F., 47·5 per cent. of the fruit in lot A and 60 per cent. in lot B showed infection or indications of infection, lot A having no well-developed decay, while lot B had 5 per cent. visible decay. From 59° upwards lot B showed a rapid increase in infection, lot A not showing this increase until 65° was reached. At 90° both lots showed numerous fruits which emitted a bad odour and in which the juice sacs were broken down and desiccated.

The greater resistance of lot A to breakdown as compared with lot B is explained by the more constant temperature and humidity of the refrigerated storage and the smaller accumulation therein of deleterious substances. The greater amount of decay in lot B was correlated with the higher percentage of black buttons in this lot, the fungus being found under all the black ones though absent under all the green ones. There was no indication that the refrigerated storage predisposed the fruit to rapid breakdown subsequently, the condition of the fruit on removal from storage being, apparently, a reliable indication of later keeping quality.

KLOTZ (L. J.). **Nitrogen trichloride and other gases as fungicides.**—*Hilgardia*, x, 2, pp. 27–52, 5 figs., 2 graphs, 1936.

This is an expanded account of investigations already noticed from another source [*R.A.M.*, xiv, pp. 163, 628].

JOHNSTON (J. C.). **Suggestions on mottle-leaf control for Tulare County.**—*Calif. Citrogr.*, xxi, 5, p. 159, 1936.

Californian experience has shown that the best control of citrus mottle leaf [*R.A.M.*, xv, p. 363] consists in spraying, preferably with zinc oxide 3 lb. per 100 galls. water. Once control has been secured spraying should be continued, using a mixture at one-third of this concentration. If it is desired to use lime-sulphur this should be combined (at the strength required) with 8 lb. zinc sulphate (25 per cent.) per 100 galls. spray, the amount of zinc being varied according to the severity of the disease, and to maintain control 3 lb. zinc sulphate should be used per 100 galls. A good spreader should be used with these sprays. Late winter or spring applications are the most effective. Treated orchards should be given adequate fertilization and carefully controlled irrigation, and tillage should not be deep or excessive.

MORSTATT (H.). **Kaffee-Schädlinge und -Krankheiten Afrikas. (Fortsetzung.)** [Coffee pests and diseases in Africa. (Continuation.)] —*Tropenpflanzer*, xxxix, 3, pp. 91–118, 8 figs., 1936.

In this paper [the first part of which, appearing in the same journal in October, 1935, dealt with insect pests], the writer summarizes the available information on diseases affecting coffee in Africa. Most of the work discussed has already been noticed in this *Review*.

TAUBENHAUS (J. J.). **Phymatotrichum root rot on winter and spring weeds of South Central Texas.**—*Amer. J. Bot.*, xxiii, 3, pp. 167–168, 1936.

Recent studies in south-central Texas demonstrated the capacity of *Phymatotrichum omnivorum* [*R.A.M.*, xv, p. 438] to overwinter on 14 winter and spring weeds, e.g., wild cotton (*Gossypium* sp.), two species of *Ipomoea*, three of *Lactuca*, *Malva rotundifolia*, *Medicago arabica*, and *Vicia reverchonii*, commonly found growing on fallow land and in fields permanently under cotton or maize. Such plants may therefore play an important part in the perpetuation of root rot by acting as bridging hosts for the spread of the fungus to succeeding cotton crops or to the summer annual and perennial weeds nearly always present in maize or fallow fields.

FEDOTOVA (Mme T. I.). Серологический метод определения сортоустойчивости Хлопчатника к заболеваниям. [Serological method for the determination of varietal resistance to disease in Cotton.] —*Pl. Prot. Leningr.*, *1935*, 5, pp. 11–32, 1935. [English summary. Received May, 1936.]

Preliminary studies described in some detail in this paper showed that the globulin fraction of the albumin extracted from the seed of a number of varieties of *Gossypium barbadense*, *G. hirsutum*, and *G. herbaceum*, reacted either positively or negatively with sera derived from rabbits sensitized by injection with cultures of *Verticillium dahliae*, *Fusarium buharicum* [*R.A.M.*, xv, p. 457] and *Bacterium malvacearum* [cf. ibid., xiv, p. 430], according to whether the varieties were susceptible or resistant to attack by these micro-organisms in the field. There also were indications that the degree of susceptibility or resistance of the varieties could be fairly accurately estimated by the intensity of the reaction.

A bibliography of 198 titles is appended.

SAREJANNI (J. A.) & CORTZAS (C. B.). **Note sur le parasitisme du Macrophomina phaseoli (Maubl.) Ashby.** [A note on the parasitism of *Macrophomina phaseoli* (Maubl.) Ashby.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 38–44, 1935. [Received July, 1936.]

Early in October, 1934, cotton plants of the native variety 'Dadictico' (*Gossypium herbaceum*) were observed in various localities in Greece to be wilted as a result of attack by *Macrophomina phaseoli* [*R.A.M.*, xv, p. 426]. The fungus was also noted on sesame, bean [*Phaseolus* sp.] (of which 100 hectares were destroyed near Copais in 1935), citrus, eggplant, and large-flowered chrysanthemum (on which

general chlorosis is produced), and in the pycnidial stage on sesame and bean only. On cotton, sesame, and bean the sclerotia measured 45 to 150 by 45 to 120 μ, and are therefore referable to Haigh's group C [ibid., xiv, p. 671]. The fungus appears to be identical with that reported on sesame from the Philippines by Petrak as *M. philippinensis* [ibid., vi, p. 757].

In the affected cotton fields *M. phaseoli* killed 5 to 40 per cent. of the plants, the attack lasting from August to October and being noted only on fully grown plants. The total loss was about one-third or one-quarter of the incidence.

Histological examination of diseased material showed that the phelloderm was not attacked by the mycelium, which apparently effected its entry through cracks in this tissue and destroyed the cells but not the fibres of the liber. It then spread to the wood. In American varieties, which though growing in the infected area had remained unaffected, the phelloderm was much thicker than in the Dadiotico variety, and this fact may explain the absence of the disease on cotton in the United States [cf. ibid., xiv, p. 670].

A list is given of 93 plants on which *M. phaseoli* has so far been recorded.

STEYAERT (R. L.). **Étude des facteurs météorologiques régissant la pullulation du Rhizoctonia solani Kühn sur le Cotonnier.** [A study of the meteorological factors controlling the development of *Rhizoctonia solani* Kühn on the Cotton plant.]—*Publ. Inst. nat. Étud. agron. Congo Belge* 7 (Sér. sci.), 27 pp., 3 figs., 1936.

During the past two years cotton in the Belgian Congo has suffered rather severely from seedling damping-off caused by *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xi, p. 454; xiv, p. 223]. Both micro- and macroscopically the fungus showed the characters of *C. solani*, the hyphae being approximately 7·5 (up to 10) μ in diameter and the lateral branches emerging at right angles and being slightly constricted at the proximal end. The pseudo-sclerotia sometimes attained a diameter of 4 mm. Other hosts of *C. solani* in the Belgian Congo include *Canavalia ensiformis*, *Centrosema plumieri*, *Calopogonium mucunoides* (on all of which it produces leaf infections), *Crotalaria retusa* (on which the mycelium spreads up the stem, bringing about the death of the leaves), *Abroma augusta*, *Bidens pilosa*, carrot, and *Tagetes* sp.

Two years' experiments made to ascertain the effect of meteorological conditions on infection showed that the chief factor in a tropical area is the amount of sunlight, which determines the soil temperature, a low soil temperature favouring an outbreak of the disease. Meteorological factors adverse to the seedlings are favourable to the fungus, and on the whole, the best period for sowing under the local conditions would appear to be from 6th until 20th July. Triumph cotton, which has become acclimatized, showed more resistance than recently introduced varieties. Seed disinfection in some cases gave very unsatisfactory results and is considered to be too expensive under Belgian Congo conditions. The most suitable control measures consist in improved cultural methods, shading, and soil aeration

KARLING (J. S.). **Fungi of British Honduras. I.**—*Ann. mycol., Berl.*, xxxiv, 1–2, pp. 1–10, 3 pl., 1936.

A full description is given of the fungus *Hypocrella* (*Aschersonia*) *turbinata* (Berk.) Petch [*R.A.M.*, xv, p. 216] observed by the author parasitizing the wax scale (*Ceroplastes floridensis*) on lime leaves, petioles, and fruits in north-western British Honduras.

LYSAGHT (AVERIL M.). **A note on an unidentified fungus in the body cavity of two Thysanopterous insects.**—*Parasitology*, xxviii, 2, pp. 293–294, 1 fig., 1936.

In the body cavity of 35 out of some 17,000 specimens of *Aptinothrips rufus*, collected from grass plots at Rothamsted in 1933–35, the writer detected a profusion of hyaline, straight or slightly curved, often vacuolar spores, 40 to 60 by 10 μ, belonging to a hitherto unidentified fungus, which was also found in one out of 100 specimens of *Limothrips cerealium*, collected on wheat in 1934. Except in one case of slight infection, the fungus induced sterility in the insects, which showed, however, no conspicuous external signs of disease. Infection is most common in the spring and early summer.

DEY (W. C.) & MAPLESTONE (P. A.). **Favus in India.**—*Indian J. med. Res.*, xxiii, 3, pp. 687–699, 5 pl. (2 col.), 1 fig., 1936.

A full account is given of the authors' morphological and cultural studies of a species of *Achorion*, with spores 4 to 6 μ in diameter, isolated from the scalp of a 16-year-old girl at Calcutta. On nearly all media the colonies are faviform, with a white, chalky, powdery appearance at first, later becoming glabrous. The chlamydospores of the fungus resemble those of *A. schoenleini*, but the former is also characterized by peculiar funnel-shaped terminal chlamydospores. Arthrospores, mycelial racquets, pectinate hyphae, and aleuriospores were also observed. In liquid media the Indian fungus forms a flocculent growth in contrast to the granular development of *A. schoenleini*, and it further differs in its cultural reactions from *A. formosensum* [*R.A.M.*, vii, p. 169] (spore diameter 3 to 4 μ) and *A. schoenleini* var. *mongolica* [ibid., xv, p. 501]. The name proposed for the writers' organism is *A. actoni* n.sp.

CATANEI (A.). **Les teignes dans les agglomérations indigènes de l'Aurès.** [Ringworm among the native centres of population of Aurès.]—*Arch. Inst. Pasteur Algér.*, xiv, 1, pp. 9–14, 1936.

Ringworm was found to be comparatively rare among the native population of the Aurès mountains (department of Constantine, Algeria), only 63 out of 528 children (under 16 years) being affected, of whom 45 (8·5 per cent.) suffered from favus (*Achorion schoenleini* [see next abstract] and 18 (3·4 per cent.) from trichophytosis (*Trichophyton glabrum* and *T. violaceum*) [*R.A.M.*, xiii, p. 577; cf. also xv, p. 152].

KITCHEVATZ (M.) & MILOCHEVITCH (S.). **Aspects cliniques de favus provoqués par le 'trichophyton faviforme album'.** [Clinical aspects of favus induced by *Trichophyton faviforme album.*]—*Bull. Soc. franç. Derm. Syph., 1936*, pp. 579–581, 1936.

The constant agent of favus of the scalp in Jugo-Slavia is stated to

be *Trichophyton faviforme album* [*T. album*: *R.A.M.*, xiv, p. 104], and details are given of the clinical and cultural data and inoculation tests on laboratory animals on which the classification of the fungus was based. The practical interest of this discovery lies in the animal origin of the species, *Achorion schoenleini*, the common agent of the trouble in question elsewhere [ibid., xv, p. 94], being a 'human' type.

De Cisneros (J. M. G. J.) & Vallejo (L. V.). **Contribución al conocimiento de la flora dermatofítica en las policlínicas de Madrid.** [A contribution to the knowledge of the dermatophytic flora in the general hospitals of Madrid.]—*Act. dermo-sifilogr., Madr.*, xxviii, 2, pp. 107–117, 1935.

Of the 150 cases of dermatomycosis examined at various hospitals in Madrid, 64 (42·6 per cent.) were found to be of fungal origin, 16 (28 per cent.) being due to *Microsporon audouini*, 9 (16·4 per cent.) to *Achorion schoenleini*, 22 (39·2 per cent.) to *Trichophyton* spp. (*T. violaceum*, *T. crateriforme*, *T. gypseum asteroides* [*T. mentagrophytes*], and *T. faviforme album* [*T. album*: see preceding abstract]) and 9 (16·4 per cent.) to *Epidermophyton* spp. (*E. inguinale* [*E. floccosum*] and *E.* Kaufmann-Wolf) [ibid., xv, p. 219].

Venturi (F.). **Su alcuni reperte di Trichophyton in un caso di kerion.** [On some manifestations of *Trichophyton* in a case of kerion.]—*Boll. Sez. reg.* (*Suppl. ital. Derm. Sif.*), xiv, 1, pp. 13–14, 1936.

Clinical details are given of a case of kerion of the scalp, with secondary involvement of the body, in a six-year-old girl. A species of *Trichophyton*, considered by Prof. Pollacci to be probably identical with *T. persicolor* [*R.A.M.*, xv, p. 366], and *Sporendonema epizoum* [ibid., xiii, p. 700] were isolated from the affected areas and the blood stream.

Artom (M.). **Su alcune micosi cutanee.** [On some cutaneous mycoses.]—*Boll. Sez. reg.* (*Suppl. ital. Derm. Sif.*), xiv, 1, pp. 42–43, 1936.

Brief notes are given on some cutaneous mycoses observed at Verona and considered to be of special interest by reason either of the rarity of the fungi concerned or of the clinical manifestations induced. *Cephalosporium acremonium* [*R.A.M.*, xv, pp. 220, 501] was isolated from a case of sycosis of the beard in a 36-year-old man; *Trichophyton persicolor* [see preceding abstract] from the arm of a male infant; *Microsporon equinum* [ibid., xiv, p. 581] (new to the locality) from a three-months-old infant; and *M. ferrugineum* [ibid., xv, p. 293] and *M. japonicum* [ibid., xiv, p. 35] from two brothers from Calabria, the former producing common herpes tonsurans and the latter an aggravated form of kerion. The possibility that the two last-named species may be merely varying manifestations of a single fungus is suggested by the circumstances of the case, which point to an identical source of infection.

DODGE (C. W.) & MOORE (M.). **Morphology, physiology and cytology of Syringospora inexorabilis (Monilia inexorabilis).**—*Ann. Mo. bot. Gdn*, xxiii, 1, pp. 129–150, 2 pl., 1936.

A study of *Syringospora* (*Monilia*) *inexorabilis* [*R.A.M.*, xii, p. 289] isolated by Mazza and Palamedi from a fatal case of blastomycosis of the skin and mucosa showed that in the host the fungus exists as a single or budding yeast-like cell. When the organism is cultivated on an artificial medium the cells send out germ-tubes or elongate to produce hyphae 2 to 5 μ in diameter, in which cross walls are formed. On several media, however, the yeast-like budding cells, measuring 2 to 17 μ in diameter, may persist or predominate for a variable length of time. The filaments formed on media with beef extract near the neutral point or with a high P_H value are generally long, with a small diameter. On wort agar the organism becomes very large, spherical, and thick-walled. A verticillate or dendroid growth is common on most media and characteristic on Raulin's solution. The uninucleate blastospores are spherical to ovoid or subpiriform to piriform and measure approximately 3 to 6 (usually 5 or more) μ in diameter. Large, terminal, clavate, or obovate cells 9 to 15 μ in diameter or long axis are also present, and lanceolate cells 9 to 15 μ in long axis also occur.

Talice and Mackinnon reduced the fungus to synonymy with *Syringospora albicans* under the synonym *Mycotorula albicans* (Robin) Langeron & Talice. The present authors, however, on grounds of difference in cultural behaviour and in its much greater virulence, consider that it should be named *S. inexorabilis* (Mazza & Palamedi) Dodge [to which genus it was transferred in Medical Mycology, p. 242: ibid., xv, p. 368], *M. albicans* Talice & Mackinnon being a synonym. Notes are given on a number of related species.

GUILLAIN (G.), BERTRAND (I.), & LEREBOULLET (J.). **Étude anatomo-clinique sur un abcès mycosique du lobe frontal.** [An anatomo-clinical study of a mycotic abscess of the frontal lobe.]—*Rev. neurol.*, lxiv, 5, pp. 684–689, 4 figs., 1935.

Clinical, anatomical, and histological details are given of a fatal case in a 33-year-old woman of an abscess in the frontal lobe of the brain. The fungus formed in the affected region presented the general characters of an *Aspergillus*, the exact identification of which by cultural studies was, however, impracticable. Two similar cases in recent French medical literature are briefly reported. In the writers' patient an ocular focus of infection is suspected.

MARKLEY (A. J.), PHILPOTT (O. S.), & WEIDMAN (F. D.). **Deep scopulariopsosis of ulcerating granuloma type confirmed by culture and animal inoculation.**—*Arch. Derm. Syph., Chicago*, xxxiii, 4, pp. 627–641, 7 figs., 1936.

This is a comprehensive clinical and cultural study of a case of ulcerating granuloma involving the inguinal, perineal, and gluteal regions in a young woman and tentatively referred to *Scopulariopsis brevicaulis* [*R.A.M.*, xv, p. 297]. Inoculation experiments on laboratory animals indicated that the pathogenic capacity of the fungus is not

very great, though it may remain viable in the tissues for 37 days and induce endothelioid or suppurative granuloma.

MIDANA (A.). **Sporotricosi localizzata con linfangite ed adenite.** [Localized sporotrichosis with lymphangitis and adenitis.]—*Boll. sez. reg. (Suppl. ital. Derm. Sif.)*, xiv, 1, p. 29, 1936.

Sporotrichum beurmanni [*R.A.M.*, xv, p. 294] was isolated from a case of lymphango-adenitis of the hand and arm [brief clinical details of which are given] in a male patient at Turin.

GOUGEROT [H.] & BURNIER [R.]. **Sporotrichose lymphangitique bilatérale. Sporotrichose professionnelle : accident du travail.** [Bilateral lymphangitic sporotrichosis. Occupational sporotrichosis accidentally contracted at work.]—*Bull. Soc. franç. Derm. Syph., 1936*, 1, pp. 69–70, 1936.

Sporotrichum beurmanni [see preceding abstract] was isolated from lymphangitic lesions on both arms of a gardener whose work exposed him to the continual risk of wounds from *Phoenix* thorns [cf. *R.A.M.*, xi, p. 647].

DAVIDSON (A. M.) & GREGORY (P. H.). **The so-called mosaic fungus as an intercellular deposit of cholesterol crystals.**—*Canad. med. Ass. J.*, xxxiv, 3, pp. 277–278, 4 figs., 1936.

Since the writers' original discovery that the so-called 'mosaic fungus' can be resolved into an aggregation of rhombic cholesterol crystals [*R.A.M.*, xv, p. 152], scales from a number of other patients have been examined and the crystalline nature of the structure amply confirmed. The crystals are arranged in masses which constitute the irregular angular segments of the mosaic. Cold potash gives the best specimens, but the crystals can also be detected in dry scales soaked in xylol and mounted in Gurr's neutral mounting medium, so that there is no justification for regarding them merely as artifacts incidental to the use of potash. The crystals may or may not bear some relation to ringworm infection but certainly do not in themselves constitute evidence of its presence.

NICHOLS (AGNES A.). **The bacteriology of canned milk products.**—*J. Soc. chem. Ind., Lond.*, lv, 12, pp. 78T–80T, 1936.

In studies at the Hannah Dairy Research Institute, Kirkhill, Ayr, it was ascertained that the reddish-brown 'buttons' sometimes observed on the surface of sweetened condensed milk are due to *Aspergillus repens*, contamination by which is thought to occur after the milk has left the vacuum pan either through the atmosphere or by the use of infected plant or containers.

GOMEZ-MENOR (J.). **Hongos que atacan al Rosal.** [Fungi that attack the Rose.]—*Rev. Agric., S. Domingo*, xxvii, 78, pp. 2304–2305, 1 fig., 1936.

Popular notes are given on the rose diseases caused in the Dominican Republic by *Actinonema* [*Diplocarpon*] *rosae* [see above, p. 559] and

Pestalozzia discosioides and on their control by spraying with ammoniacal copper carbonate or Bordeaux mixture.

GREEN (D. E.). **The ink disease (or bulb scab) of Iris reticulata caused by Mystrosporium adustum Massee.**—*J. R. hort. Soc.*, lxi, 4, pp. 167–175, 5 pl., 1 fig., 1936.

Following an outline of the history of ink disease of *Iris reticulata* (*Mystrosporium adustum*) [*R.A.M.*, xiv, p. 12], its symptoms, morphology, and physiology, the writer describes a series of experiments at the Royal Horticultural Society's Garden, Wisley, Surrey, from which it was apparent that the planting of bulbs with inky markings led to a gradual decrease in numbers, especially in unsterilized garden soils where secondary agents of decay are active. Disappointing results were given by the various standard methods of control tested, and the safest practice is probably to destroy all bulbs with black areas on the inner fleshy portion and to remove any infected outer scales. Even when the discoloured patches were excised and the bulbs immersed for an hour in 2 per cent. formalin, infection persisted on a fair percentage of the progeny, showing the need for protracted isolation of such stocks if they are to be retained at all.

PAPE (H.) & MARGGRAF (M.). **Bekämpfung von Mehltau und Rost an Chrysanthemen.** [Control of Chrysanthemum mildew and rust.] —*Blumen- u. PflBau ver. Gartenwelt*, xl, 17, pp. 202–203, 1936.

Replying to an inquiry as to the best means of combating chrysanthemum mildew (*Oidium chrysanthemi*) and rust (*Puccinia chrysanthemi*) [*R.A.M.*, xii, pp. 642, 677; xv, p. 78], H. Pape recommends (in addition to cultural measures) spraying with sulphur-containing preparations, e.g. cosan [ibid., xi, p. 682], erysit [ibid., x, p. 461], vomasol S [ibid., xii, p. 380], and solbar, or dusting with finely ground or ventilated sulphur, approved brands of which include antiperoid, Novezza, Ventilato-prima, extra-ventilated (hochventiliert) sulphur Sternmarke KCo, Ventilato Imperal, and Ventilato. The treatments should be given fortnightly or oftener and are most effective in warm, sunny weather.

Sulphur-containing preparations, including kolloisan and thiocol, are also advised by M. Marggraf for the control of *O. chrysanthemi*, but rust should be treated by the application at two- to three-weekly intervals of 1 per cent. ordinary or Wacker's Bordeaux mixture [ibid., xv, p. 539], followed, four weeks before cutting, by an application of 1 per cent. Burgundy mixture.

GAUDINEAU (Mlle M.). **Le flétrissement des Reines-Marguerites dû au Fusarium callistephi.** [Wilt of China Asters due to *Fusarium callistephi*.]—*Rev. Path. vég.*, xxiii, 2, pp. 123–130, 1 fig., 1936.

Since 1931, China asters [*Callistephus chinensis*] growing in widely separated localities in France have been seriously infected by *Fusarium conglutinans* var. *callistephi* [*R.A.M.*, xiii, p. 516], the symptoms caused by which are briefly described. The disease appears generally about the beginning of July and is favoured by a temperature about 22° [C.] and to a lesser degree by soil moisture, excess of nitrogen, and lack of lime. Seed treatment for 20 minutes with commercial formalin (2·5 per mille)

resulted in marked reduction in infection except when the weather conditions strongly favoured the fungus, in which case soil disinfection of the seed-beds with 1 to 2 per cent. formalin at the rate of 25 l. per sq. m. also became necessary. Trials at Versailles showed that a variety of American origin, Los Angeles (not the same as Super Giant Los Angeles), was completely resistant, while the following French varieties were strongly resistant: Victoria géante (crimson), Comète géante (dark violet, also white), and Victoria imbriquée (dark blue).

Fron (G.). **La maladie de la fusariose des Oeillets.** [Fusariosis disease of Carnations.]—*Rev. Path. vég.*, xxiii, 2, pp. 131–144, 3 figs., 1936.

In 1932 heavy losses were sustained by carnation growers in different parts of France as a result of the wilt disease caused by *Fusarium dianthi* [*R.A.M.*, xiii, p. 31; xv, p. 225], a species referred by Wollenweber to *F. conglutinans* var. *major* [but maintained as a distinct species in Wollenweber's and Reinking's recent monograph: ibid., xiv, p. 708]. Apparently vigorous plants would develop a young shoot which changed colour and dried up, desiccation progressing rapidly; simultaneously at the collar lesions were formed in which the tissues were destroyed to a considerable depth, and the plant snapped off at this level at the least touch. The fungus was readily isolated from diseased plants.

From the results obtained in preliminary experiments on control the author recommends that cuttings should be made as far as possible from healthy plants only, and steeped for 12 to 18 hours in a 1 in 20,000 solution of neutral orthooxyquinoline sulphate, after which they should be potted and given the usual fungicidal treatment with the same solution. After the plants have been transferred to the glasshouse further spray applications should be made at concentrations ranging from 1 in 20,000 to 1 in 50,000. Diseased plants should be burnt. This method resulted in a loss of only 3 to 5 per cent. in most varieties, while susceptible varieties such as Page showed only 25 to 30 per cent. loss; on the Alsace variety losses of 60 to 80 per cent. were reduced to 15 to 20 per cent. The treatment was also effective in preventing the germination of spores of *Puccinia dianthi*.

Lindegg (Giovanna). **Il seccume e il marciume fogliare del Pelargonio.** [Wilt and leaf rot of *Pelargonium*.]—*Riv. Pat. veg.*, xxvi, 1–2, pp. 1–9, 2 figs., 1936.

The author gives an expanded account of the disease of *Pelargonium zonale* caused by *Macrosporium macalpineanum* which was recently reported by Ferraris [*R.A.M.*, xv, p. 442]. In the early stages of infection only two or three isolated spots are present on each leaf; they are round to oval, 0·5 to 1 cm. in diameter, brown, zonate, with a dark reddish, raised rim, later drying up and acquiring a papery consistency. On the lesions are found conidiophores of the fungus, 100 to 120 by 3 to 4 μ, each bearing a single conidium, with 2 to 8 transverse septa and occasional longitudinal ones, 50 to 20 μ when mature with a peduncle [beak] 10 μ in length. The severity of the infection, which caused an abundant leaf fall, is attributed to humid weather.

Jurišić (J.). **Neue Pilze aus Jugoslawien.** [New fungi from Jugo-Slavia.]—*Ann. mycol., Berl.*, xxxiv, 1–2, pp. 57–58, 1936.

Latin diagnoses are given of three new species of fungi collected in Jugo-Slavia and described (in unpublished correspondence) by Dr. F. Bubák of Prague in 1923. *Aecidium banaticum* Bubák, found causing a yellow discoloration of *Viola tricolor* leaves and sepals in sandy soil at Deliblato, Banat, is characterized by hypo-, more rarely epiphyllous, cupuliform aecidia with reflex, lacerated margins. The variably shaped, indistinctly seriate pseudoperidial cells increase in thickness towards the interior and measure 20 to 35 by 16 to 22 μ. The globose to oblong, polyhedral, thin-walled, finely verrucose, hyaline spores with yellow contents measure 18 to 27 by 18 to 22 μ.

Van Gennep (V. C.). **De symptomen van physiologische ziekten van Lupinus luteus L.** [The symptoms of physiological diseases of *Lupinus luteus* L.]—Thesis, Univ. of Utrecht, x+107 pp., 6 pl., 6 figs., 4 graphs, 1936. [English summary.]

An exhaustive account is given of the writer's laboratory experiments to determine the effect on yellow lupins (*Lupinus luteus*) of deficiencies of the essential elements, phosphorus, potassium, magnesium, nitrogen, boron, manganese, copper, calcium, and iron [*R.A.M.*, xv, p. 298]. Shortage of the last-named rapidly induced severe chlorosis and withering, accompanied by stunting or abnormal elongation of the roots. It was experimentally shown that iron deficiency is responsible for lime-induced chlorosis.

A ten-page bibliography is appended and a brief survey of the relevant literature precedes the sections on the various elements used in the investigations.

Lindenbein (W.). **Zytologische und histologische Untersuchung der auf den Blättern von Kalimangelpflanzen bei Gramineen und Inkarnatklee auftretenden Weissfleckigkeit.** [A cytological and histological study of the white spotting occurring on the leaves of Graminaceous and crimson Clover plants deprived of potash.]—*Ernähr. Pfl.*, xxxii, 8, pp. 144–150, 6 figs., 1936. [English and Spanish summaries on p. 160.]

The white spotting of the leaves of potash-deficient *Dactylis glomerata*, *Phalaris arundinacea*, *Festuca pratensis*, and crimson clover (*Trifolium incarnatum*) observed by Lowig in connexion with his mildew [*Erysiphe graminis* and *E. polygoni*] experiments at Bonn University [*R.A.M.*, xiv, p. 571] is fully discussed from the cytological, histological, and anatomical standpoints.

The disturbance is not identical with Sorauer's 'spot necrosis' (*Ber. dtsch. bot. Ges.*, xxi, p. 526, 1903; *Landw. Jb.*, xxxiii, p. 585, 1904), which mostly occurs as a brown spotting in the normal course of the growing period of the leaf. It is also not merely a consequence of defective chlorophyll formation but rather a symptom of cytological degeneration (using 'cytological' in Küster's sense of a genuine pathological breakdown of the cell involving the membranes and ultimately leading to histolysis of the type induced by adverse nutritional factors, such as potash deficiency).

Richter (H.). **Fusskrankheit und Wurzelfäule der Lupine. (Erreger: Rhizoctonia solani K.).** [Foot disease and root rot of the Lupin. (Agent: *Rhizoctonia solani* K.).]—*Zbl. Bakt.*, Abt. 2, xciv, 5–8, pp. 127–133, 3 figs., 2 graphs, 1936.

Lupins (*Lupinus angustifolius*, *L. luteus*, and *L. albus*) in Germany are stated to suffer from a foot and root rot, associated with stunting, wilting, premature defoliation, and shrivelling of the pods, the causal organism of which was identified as *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, xii, p. 96; xv, p. 510]. Comparative studies of *C. solani* from lupins, potatoes, and conifer seedlings and of the organism usually referred to *Moniliopsis aderholdi* from *Cereus* and vine revealed no essential differences and it is concluded that the latter is not entitled to specific but at most to varietal rank [ibid., xiv, p. 278].

Cross-inoculation experiments were carried out on lupins and potatoes (Aal, Erdgold, and Maibutter varieties) with nine different strains of the fungus, of which only one of the four from lupins infected potatoes, while the two most virulent on potatoes (from potato and *Cereus*) were only slightly pathogenic to lupins. The latter host was further attacked severely by one of the two vine strains, while the other and that from conifers caused milder symptoms. Both in pathogenicity relations and in rapidity of mycelial growth the potato and *Cereus* strains showed marked similarities.

Weimer (J. L.) & Madson (B. A.). **Relative resistance to bacterial wilt of certain commercial and selected lots of Alfalfa.**—*J. agric. Res.*, lii, 7, pp. 547–555, 1936.

A tabulated account is given of experiments, started in 1930, at Delhi and Davis, California, in which lucerne plants obtained from 59 lots of seed from various sources were inoculated twice with *Phytomonas insidiosa* [*Aplanobacter insidiosum*: see above, p. 559] and were grown in field plots for six months or one year after each inoculation. Seed was obtained from the plants that remained healthy and the progeny of this seed was tested for resistance to the wilt. The results again confirmed the findings of previous investigators, in that they showed that Turkestan, Hardistan, and Ladak lucerne lots contain the highest percentages of resistant individuals; a few plants from some other seed lots also survived the two inoculations and their progenies are now being tested. The fact that three lots of Iran (Persia) lucerne contained more resistant individuals than most of the others raises the question as to whether these lots did not come originally from Turkestan, since most of the Iran lots have hitherto shown relatively low resistance. There was clear evidence that resistance is transmitted to the progeny in varying degrees by different individual plants.

Kheswalla (K. F.). **Fruit diseases in Baluchistan.**—*Agric. Live-Stk India*, vi, 2, pp. 204–215, 6 pl. (2 col.), 1936.

Notes are given on the fruit diseases observed by the writer in Baluchistan in 1932 and 1933. Heavy damage is stated to be caused by the blister disease of apples (*Coniothecium chomatosporum*) [*R.A.M.*, xiv, p. 617], which also affects plums in a mild form. Control may be

secured by two applications of lime-sulphur at summer strength. Apples are further liable to infection by *Penicillium expansum* [ibid., xiv, p. 286], *Trichothecium roseum* [ibid., xiii, pp. 35, 108; xiv, p. 40], *Alternaria* rot, Jonathan spot [ibid., xv, p. 300], leaf scorch [ibid., x, p. 43] (also affecting apricots and walnuts), *Cytospora* stem canker [ibid., xi, p. 186], and mildew (*Oidium* sp.).

Pear trees at the Quetta Fruit Experiment Station suffer considerable damage from a die-back, due possibly to the action of the sun's rays and dry winds on the tender tissues.

Peaches are liable to infection by leaf curl (*Taphrina deformans*) and scab (*Cladosporium carpophilum*). Splitting is a common defect of physiological origin in peaches, and a species of *Rhizopus* frequently gains access to the affected kernels. Gummosis (non-parasitic) occurs in heavy, poorly-drained, over-manured soils [cf. ibid., xii, p. 575 *et passim*]. Certain trees have shown the leaf but not the fruit symptoms associated with peach yellows [ibid., xv, p. 516], and prompt removal of suspected cases is recommended. A species of *Alternaria* produces on peach leaves light brown, circular lesions, up to 3 mm. in diameter, surrounded by darker rings. Irregular, dark brown spots are formed on the foliage by a species of *Coniothecium*; the diseased tissues may fall out, giving a shot-hole appearance to the leaves.

Almonds, apricots, and peaches are subject to infection (mostly foliar) by *Phyllosticta prunicola* [ibid., x, p. 296], which overwinters on fallen leaves. Associated with a species of *Alternaria* causing a dark brown, irregular spotting of almond leaves is a *Coniothecium* closely resembling that mentioned above as infecting peach foliage. *Oidiopsis taurica* [see above, p. 554] was observed on one or two almond trees. A species of *Cytospora* occurred on the chalk-white limbs of almonds and another strain caused a die-back of walnut [ibid., xii, p. 270].

Severe damage may be caused in vineyards by powdery mildew (*Uncinula necator*) [ibid., xi, p. 622] in the absence of proper precautions against the disease; epidemics are liable to occur when dry conditions follow a brief rainy spell. In Baluchistan the mildew appears to be restricted to the fruits and only the *Oidium* stage has been observed. Vine leaves are attacked by a species of *Clasterosporium* with dark brown, uni- to biseptate conidia, which forms on the under sides dark, velvety, irregular lesions, 1 to 8 mm. in diameter. A malodorous rot of watermelon is caused by *Pythium aphanidermatum* [ibid., xiv, p. 7]. A brownish to black discoloration of pomegranate seeds, the central cavities of which are filled with spores, is caused by *Aspergillus castaneus* Patt.; infection may occur either through insect punctures in the rind or at the calyx end.

The paper terminates with some brief general recommendations for the control of fruit diseases by cultural measures and spraying.

PITTMAN (H. A. J.). **'Black spot' or 'scab' of Apples.**—*J. Dep. Agric. W. Aust.*, 2nd Ser., xiii, 1, pp. 20–29, 5 figs., 1936.

In 1936, apple scab (*Venturia inaequalis*) caused exceptionally serious losses in eastern Australia, the prevailing weather having been particularly favourable to infection. The disease was first officially recorded in Western Australia in 1930 [*R.A.M.*, ix, p. 792], and the outbreaks

were successfully controlled. No further infections occurred in Western Australia until 5th February, 1936, when a new outbreak was found near the site of the first attack. A number of Yates and Cleopatra trees near the centre of the orchard were rather seriously affected, several Granny Smith trees and one Winter Pearmain being very slightly infected. Altogether, forty or fifty apple trees over an area of about 1½ acres were affected. Infection had spread from a very badly diseased tree in the direction of the two prevailing winds; no infection was present in any neighbouring orchard or in that where the 1930 outbreak had occurred. The methods used in combating the outbreak are described, and the paper concludes with notes on the economic importance of eradication in Western Australia, the geographical distribution of the disease, symptoms, life-history, and control.

In a footnote a further outbreak of the disease is recorded, almost entirely restricted to a few rows of Cleopatra trees.

WEBER (ANNA). **Aeble og Paereskurv. En af Frugtavlernes værste Fjender.** [Apple and Pear scab. One of the fruit-grower's worst enemies.]—Suppl. to *Producenten*, 16, 14 pp., 9 figs., 1936.

Popular notes are given on the symptoms, mode of infection, and control of apple and pear scab [*Venturia inaequalis* and *V. pirina*] in Denmark [*R.A.M.*, v, p. 559; ix, p. 113], with notes on varietal susceptibility, liability to spray injury, and other points of interest.

OSTERWALDER (A.). **Schorfbekämpfungsfragen.** [Scab control problems.]—*Schweiz. Z. Obst- u. Weinb.*, xlv, 7, pp. 115–118; 8, pp. 136–139, 1936.

Sulfomaag (a highly concentrated Bordeaux mixture supplied by Chem. Fabr. R. Maag, Dielsdorf) was experimentally shown to be fully equal at a strength of 1 per cent. to the ordinary Bordeaux at 2 per cent. in the control of apple scab [*Venturia inaequalis*] and is accordingly recommended for this purpose on grounds of economy. It was equally effective with cupromaag [*R.A.M.*, xv, p. 1] for late (mid-August) applications on the Boiken variety, which tends strongly to the belated development of infection. The results obtained with Bordo-Xex (Chem. Fabr. 'Flora', Dübendorf) in tests against apple, pear [*V. pirina*], and cherry [*V. cerasi*] scab were conflicting. Little advantage was derived in 1935 from two pre-blossom treatments of apples with Bordeaux mixture as compared with one.

MOORE (M. H.). **Some observations on the influence of manurial dressings and of certain other factors on the incidence of scab (Venturia inaequalis (Cooke) Wint.) and of spray-injury in Apples.**—*J. Pomol.*, xiv, 1, pp. 77–96, 2 figs., 1936.

The data obtained from observations made incidentally to pomological studies in an orchard of Bramley's Seedling and Worcester Pearmain apple trees indicated that the degree of fruit infection by *Venturia inaequalis* was governed by the manurial treatment given, grassing-down, seasonal conditions, and the rootstocks on which the trees were worked [*R.A.M.*, x, pp. 37, 192, 466; xiv, pp. 317, 590]. In general, nitrogenous manuring increased the tendency to scab, while grassing-

down decreased it. Rootstock influence showed differential reactions to these stimuli, and weather conditions provided a further source of variation in response. On the leaves the disease was also influenced by rootstock and manurial treatment. Other factors omitted, the fruit of both varieties was more susceptible to scab on trees worked on rootstocks Nos. III, IV, VII, or X, than on those worked on Nos. I, II, V, or VI; the reaction of Cox's Orange Pippin on these rootstocks was, however, mostly different. In 1934, fruit russeting on Bramley's Seedling caused by a petal-fall application of Bordeaux mixture was rather more severe on trees receiving only nitrogen than on those receiving potash, nitrogen with potash, or no manure. The trees on rootstocks Nos. I, IV, and V showed more russeting than those on Nos. II, III, VI, VII, and X.

Clear evidence was obtained that the relationship between scab incidence and manurial treatment is not a simple issue, governing factors of primary importance being the scion variety, the rootstock, and the weather conditions. Soil conditions are also probably an important factor. These variables exert their several influences one upon another, so that the ultimate reaction on the tree and therefore to the disease is of very complex origin.

ARK (P. A.) & THOMAS (H. E.). **Persistence of Erwinia amylovora in certain insects.**—*Phytopathology*, xxvi, 4, pp. 375–381, 1936.

The internal organs of *Drosophila melanogaster* and *Musca domestica* larvae fed on apple medium contaminated by *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xv, p. 515] were found to contain the organism, which persisted through the pupal to the adult stage in both insects. Eggs of *M. domestica* from contaminated females carried the organism externally but not internally, while it was internally harboured for six, three, and four days, respectively, by adults of *D. melanogaster*, *M. domestica*, and *Lucilia sericata*. The bacteria remained viable in the viscera of honey-bees (*Apis mellifica*) for 48 hours but were not recovered from the heads after 12 hours from the time of inoculation [ibid., xiv, p. 370].

BARTHELET (J.). **Recherches expérimentales sur les traitements des tavelures des arbres fruitiers et du mildiou de la Vigne.** [Experimental researches on treatments against fruit tree scabs and Vine mildew.]—*Ann. Epiphyt.*, N.S., i, pp. 103–119, 2 pl., 1936.

Experiments carried out from 1933 to 1935 inclusive at Versailles showed that the most efficacious spring application of Bordeaux mixture against pear scab (*Venturia pirina*) [*R.A.M.*, xv, p. 234 and next abstract] was the second one, given after flowering, in 1933, the first one, before flowering, in 1934, and the third one, after flowering, in 1935. When the dates of these applications are correlated with the dates of the first outbreaks each year and the meteorological conditions prevailing it becomes apparent that, as regards the Paris region, no particular date for spring treatment against *V. pirina* can be recommended. Spray applications should be made before and after flowering and again a fortnight later. The same remarks apply to apple scab (*V. inaequalis*). When rain prevails at the end of summer one or two supplementary treatments are necessary.

Experimental evidence confirmed the view that in the vicinity of Paris five applications of Bordeaux mixture made on 15th June, 15th July, 1st and 15th August, and 1st September are sufficient to ensure complete protection of grapes against *Plasmopara viticola*.

Comparative tests of numerous fungicides employed against these diseases showed that 2 per cent. Bordeaux mixture was the most efficacious against *V. pirina* and *P. viticola* and 1 per cent. against *V. inaequalis*. The addition of alum and sulphate of ammonia [ibid., xiv, p. 814] in no instance increased and occasionally reduced the effectiveness of Bordeaux mixture. Copper hyposulphite 5 per 1,000 was efficacious against *P. viticola* in the one test made with it. Copper fluosilicate (0·5 per 1,000) caused serious scorching of vine foliage, while at half this strength it was no longer efficacious, though still producing some scorching.

Moreau (L.) & Vinet (E.). **De l'amélioration et de la défense de la production fruitière.** [On the improvement and defence of fruit production.]—*Ann. Epiphyt.*, N.S., i, pp. 257–275, 1936.

Spraying tests carried out on William pears at Angers in 1935 showed that the best combined treatment against *Carpocapsa pomonella* and *Venturia pirina* [see preceding abstract] was a cupro-arsenical mixture consisting of 1 kg. copper sulphate, 3 kg. sifted lime containing 64 per cent. of free lime, and 1 kg. diplumbic lead arsenate per 100 l. This mixture gave practically complete control, following six applications on 8th and 24th April, 16th May, 3rd June, and 11th and 23rd July.

Fikry (A.). **Water-table effects. II. Relative incidence of diseases on stone-fruit trees.**—*Bull. Minist. Agric. Egypt* 154, 52 pp., 43 pl., 23 graphs, 1936.

Continuing his earlier investigations [*R.A.M.*, xiv, p. 177], the author made a detailed study of the effect of varying heights of the sub-soil water-table on the physiological gumming disease that affects plums, peaches, and apricots in Egypt, as well as on shot hole (*Clasterosporium carpophilum*) and rust (*Puccinia pruni-spinosae*) [ibid., xv, p. 236] of the same hosts and peach mildew (*Sphaerotheca persica*) [*S. pannosa*]. The experiments, which lasted from 1931 to 1934, inclusive, were carried out on a piece of land at the Nile Delta Barrage naturally divided into low, medium, and high terraces, the difference in soil-level between the low and high plots being about 100 cm. The plum varieties used were Wickson, Bokra, and Japanese Gold worked on Mariana (resistant) and Myrobolan (susceptible) rootstocks; the peaches and apricots were Beladi varieties raised from seed.

Monthly examinations were made, and the results obtained [which are tabulated] may be briefly summarized as follows. A high sub-soil water-table rendered the trees subject to fatal gumming and severe infection by the three other diseases. Growth and yield were better on the high terrace than the low one. Attack by all four diseases was severe during and immediately after the inundation period, i.e. from August to December, and decreased from January to July, though that of mildew, which occurred only on peaches, was also severe in June and July. The incidence of *S. pannosa* was very heavy in the low terrace

and very slight in the high one, but it appeared when water-table and air humidity was lowest. Susceptible plum varieties showed slight resistance to gumming on the high terrace and resistant plums slight susceptibility on the low one. The exceptionally high Nile flood of 1934 was detrimental to stone fruit trees in low-lying lands and some other districts, the trees wilting or shedding their leaves and finally dying. All the peaches and apricots in the low terrace and about half those in the middle one were dead by September or October, though not one tree was killed on the high terrace. The plums were also more severely affected in the two lower terraces than in the top one.

It is concluded that the water-table effect is greater than that of all other factors on the incidence and development of the diseases studied. The effect on rust and shot hole is direct and immediate, on gumming is less direct and more fundamental, and on peach mildew is quite abnormal.

Sarejanni (J. A.). **L'apoplexie des arbres fruitiers des environs d'Athènes.** [Apoplexy of fruit trees in the vicinity of Athens.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 45–50, 1935. [Received July, 1936.]

A large number of fruit trees, especially cherries, apricots, and peaches growing in the vicinity of Athens, are killed off each year during the period May to August as a result of attack by apoplexy [*R.A.M.*, xiv, p. 215]. In four years' investigations into the disease *Verticillium albo-atrum* was isolated from the trunks of 5- to 7-year-old affected apricots only. *Phytophthora cactorum* [cf. ibid., x, p. 214] was associated with the condition in apricot seedlings and 5- to 7-year-old trees showing lesions at the collar. Tumours resembling those caused by *Bacterium tumefaciens* were noted on cherry and almond trees that had succumbed, in practically all cases the presence of the bacterium being associated with attack by *Capnodis tenebrionis*. The author considers that the term apoplexy is commonly applied to various diseases due to a number of different factors.

Sarejanni (J. A.). **Sur le Sclerotinia de l'Amandier.** [On the Almond *Sclerotinia*.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 57–60, 1935. [Received July, 1936.]

In the Cretan almond orchards *Sclerotinia cinerea* [*S. laxa*] sometimes reduces the crop by nine-tenths. Infection falls into three stages. The first takes place mainly through the flowers, whence the fungus progresses to the peduncle and to the adjacent young branch. In the second stage the fruits become atrophied, and in the third the current year's branches are attacked. The last stage occurs at the end of April or early in May, when warm weather arrests further progress. Preliminary experiments showed that fungicidal treatment is of no value unless preceded by severe pruning and careful orchard sanitation, including the removal of all cankers and mummified almonds.

Rudolph (B. A.). **Brown rot of stone fruits on the Pacific coast and its control.**—*Bett. Fruit*, xxx, 10, pp. 3–5, 2 figs., 1936.

The losses to growers of stone fruits on the Pacific coast from brown

rot [*Sclerotinia fructicola*: *R.A.M.*, xiii, p. 33; xv, p. 304], which causes a blossom blight and ripe fruit rot, are stated to exceed those from all other diseases put together. Orchard sanitation is of cardinal importance in control, and should include ploughing in of the mummified fruits on the ground before the blossoms open to prevent infection of the blossoms. Apricots and peaches should be sprayed with Bordeaux mixture (5–5–50 or 6–6–50, or, in very damp regions 8–8–50) when the fruit buds are cracking and prunes and cherries when the winter buds have released the cluster buds and the latter have burst. As a rule, one thorough spray application suffices to give practical control. Alternatively prunes, plums, peaches, and cherries should be sprayed with wettable bentonite sulphur [ibid., xv, p. 484] or flotation sulphur [ibid., xv, p. 514], or dusted with these materials whenever infection appears. Applications immediately before picking are inadvisable, particularly for canning fruit, as the presence of much sulphur causes the cans to darken inside, but an application should always be given three or four weeks before gathering, whether the disease is present or not.

MAGEE (C. J.). **Bunchy top disease of Bananas. Rehabilitation of the Banana industry in New South Wales.**—*J. Aust. Inst. agric. Sci.*, ii, 1, pp. 13–16, 1936.

In this account of the successful war waged against banana bunchy top in New South Wales [*R.A.M.*, xiii, p. 642] it is stated that the disease was probably introduced in 1913 on material from Fiji. By 1922 there were some 5,500 acres planted to bananas in New South Wales, and the disease was then a serious menace. Unsuccessful attempts were made to check spread by the introduction of buffer zones, but by 1925 the area under bananas had fallen to 1,500 acres and production had decreased from 649,500 bushels (1922) to 90,000 bushels. At least 90 per cent. of the land under bananas in 1922 ceased production.

In 1924–5 an investigation of the disease showed that it was due to a virus disseminated from infected suckers by *Pentalonia nigronervosa*. Control measures involving the registration of plantations, eradication of diseased plants, and controlled replanting were drawn up and in 1927 regulations were gazetted proclaiming quarantine areas and governing the movement of suckers, &c. As a result, the acreage under bananas has increased from 1,992 acres in 1928 to 20,133 acres in 1935, the respective figures for production being 112,054 and 1,500,000 bushels. No serious outbreaks occurred until 1935, when the disease again became well entrenched in a few limited areas; so far, the industry has not become again imperilled, but the outbreaks show the necessity for continued vigilance.

WARDLAW (C. W.) & LEONARD (E. R.). **The storage of West Indian Mangoes.**—*Mem. Low Temp. Res. Sta., Trin.*, 2, 47 pp., 12 graphs, 1936.

In this account of the behaviour of mango varieties in cold storage it is stated that a close relation exists between mango anthracnose (*Gloeosporium mangiferae*) [*R.A.M.*, xiv, p. 518] and the physiology of ripening. The disease sometimes occurs as a destructive blight on the flowers and setting fruits, and later on the fungus appears in apparently

healthy adult fruits ripening on the tree or in storage. The evidence obtained showed that such infections have been latent for some time.

If mangoes are picked within a few days of eating-ripeness, after two or three days the fruit softens and latent *G. mangiferae* infections appear as numerous small spots, probably following a transition from aerobic to anaerobic respiration. It is not until later that the common storage saprophytes become active agents in fruit rotting. The outstanding types of wastage are *Dothiorella* stem-end rot [cf. ibid., xv, p. 238] and lateral decay (the major cause of wastage in Trinidad fruit) in the form of profuse anthracnose spotting [cf. ibid., xi, p. 793; xii, p. 521]. A *Phomopsis* and *Pestalozzia funerea* [ibid., xiv, p. 608] were occasionally isolated from lateral blemishes.

Most mango varieties (if the fruit is picked when full-grown green or rather more mature) show plain chill effects at 40° and 45° F. after 5 to 20 days. An abnormally early appearance of anthracnose spots is also a sign of chill injury. Fruit held at 50° for over 15 to 20 days was severely attacked and a storage temperature of 48° is tentatively suggested.

The data obtained indicate that Trinidad mangoes are considerably more subject to disease at the end of the fruiting season than at other times, and it seems unlikely that the total commercial wastage can be curtailed to the 10 per cent. allowed for other fruits. The high incidence of field infections shows that the whole question of orchard sanitation needs to be carefully considered.

Simmonds (J. H.). **Passion Vine diseases.**—*Qd agric. J.*, xlv, 4, pp. 322–330, 8 figs., 1936.

Popular notes are given on the following diseases of passion fruit [*Passiflora edulis*] and their control in Queensland: brown spot (*Alternaria* sp.) [previously referred to *Macrosporium* sp.; *R.A.M.*, xii, p. 41], also affecting granadilla (*P. quadrangularis*) and the white passion flower (*P. alba*); scab (a strain of *Cladosporium herbarum*) [ibid., xii, p. 40], restricted mainly to high altitudes; base rot, a trouble of obscure origin, believed to be due to the penetration of the plants through wounds by a soil organism; and woodiness [ibid., x, p. 394; xiii, p. 44], which has assumed serious proportions in the State since 1931 and must now be accounted the most important disease of the crop. The virus responsible for the condition is almost certainly transmitted from infected to healthy vines by certain sucking insects as well as by means of the sap adhering to the hands or to pruning knives.

Artemieff (G. V.). Грибные болезни Фейхоа. [Fungal diseases of *Feijoa.*]—*Советские Субтропики* [*Sovetsk. Subtrop.*], *1935*, 7, pp. 61–63, 5 figs., 1935. [Received June, 1936.]

An account is given of the author's investigation of the fungal diseases of *Feijoa sellowiana* in three Agricultural Experimental Stations in the neighbourhood of Sotchi [Caucasian littoral of the Black Sea] in view of the attempts that are being made to introduce the commercial cultivation of this fruit tree in that region. Besides a serious blossom blight caused by *Botrytis cinerea*, and two leaf spots of minor importance caused by *Pestalozzia versicolor* [*R.A.M.*, x, p. 247] and *P. gracilis*

Kleb., respectively, the studies showed the occurrence there of the following hitherto undescribed parasitic fungi, brief Russian descriptions of which are given [without Latin diagnoses]: *Phyllosticta feijoicola* n.sp. causes, on young seedlings, a severe grey, angular leaf spotting, with subsequent dropping out of the affected tissues. The pycnidia are epiphyllous, at first submerged and later erumpent, globose, sparse, and 80 to 120 μ in diameter; the pycnospores are hyaline, oblong-ellipsoidal, and 6·5 to 7·5 by 2·5 μ. This species is believed to be the imperfect stage of *Leptosphaeria feijoae* n.sp., which also occurs on the tree in nature, and is characterized by globose, hypophyllous, isolated or aggregated, submerged perithecia, 100 μ in diameter. The asci are cylindrical, sometimes slightly bent, 35 to 40 by 7 to 7·5 μ, and surrounded by a few paraphyses. The ascospores (eight) are olive-coloured, spindle-shaped, pointed at both ends, 3- to 4-septate, and 14 to 15 by 2·5 to 3 μ. *P. feijoae* n.sp., causing a grey, circular leaf spot, has chiefly epiphyllous, at first subepidermal and later erumpent, pycnidia 80 to 120 μ in diameter. The pycnospores are ellipsoidal, continuous, and 3·7 to 5·5 μ. The ascigerous stage of this fungus is apparently *Mycosphaerella feijoae* n.sp., with hypophyllous (rarely epiphyllous), crowded, globose, perithecia, 70 to 90 μ in diameter; the asci are cylindrical-clavate, rounded at the apex, slightly curved, with eight uniseptate, spindle-shaped, smooth, greenish ascospores measuring 10 by 3 μ. *Phoma feijoae* n.sp., the cause of a die-back of twigs, has flattened, oblong-oval, subepidermal and later erumpent pycnidia, 150 by 250 μ, and hyaline pycnospores measuring 3 to 5 by 1 μ. This list is admittedly not exhaustive.

De Ong (E. R.). **Improved wettable and dusting sulphurs.**—*Bett. Fruit*, xxx, 10, pp. 10–11, 3 figs., 1936.

The author describes the superiority of precipitated 'micro-sulphur', now made available by the gas industry in America, to sublimed or ground sulphur from the point of view of particle size (which in the former is often less than 1 μ), alkalinity, and free-flowing properties due to its normal content of inert substances which replace the fillers, such as magnesium carbonate, necessarily added to other sulphurs.

In field work a blend of 'micro-sulphur' with ground brimstone facilitates distribution and prevents drift, the finer particles adhering to the larger ones, and extends the control period to three weeks or more by preventing sublimation, which takes place within ten days at high temperatures in the case of extremely fine sulphur alone. Blends of this kind have proved especially valuable in the control of apple diseases, including scab [*Venturia inaequalis*] and mildew [*Podosphaera leucotricha*].

Martin (H.). **The scientific principles of plant protection.** Second edition.—xii+379 pp., London, Arnold & Co., 1936. Price 21*s*.

The second edition of this comprehensive survey of the scientific principles underlying methods of plant protection (which also aims at providing a book of reference upon insecticides and fungicides) differs little in plan from the first [*R.A.M.*, viii, p. 115], though the inclusion of new material has necessitated drastic revision of the text, the whole

work having been rewritten except for the introductory chapter. Ninety pages are devoted to fungicides, 17 to spreaders and stickers, and there are also chapters on seed and soil treatments. Every phase of the subject has developed in the eight years that have passed since the first edition appeared, particularly epidemiology, applications of synthetic chemistry, and the technique of assessing insecticidal and fungicidal efficiency in the laboratory, and the advances made are concisely incorporated in the new edition of this useful book.

GOLDSWORTHY (M. C.) & GREEN (E. L.). **Availability of the copper of Bordeaux mixture residues and its absorption by the conidia of Sclerotinia fructicola.**—*J. agric. Res.*, lii, 7, pp. 517–533, 1 fig., 1936.

This is a full report of the authors' investigations on the toxic action on the conidia of *Sclerotinia fructicola* of Bordeaux mixture deposits that have been exposed on glass slides to weathering and ageing under natural conditions in the orchard, an abstract from which has already been noticed from another source [*R.A.M.*, xiv, p. 381]. It is stated that conidia in which germination is delayed do not absorb copper, this process being correlated with the initiation of activity. When the quantity of copper in the residue is small, it may be exhausted by the conidia germinating first, the later ones escaping injury. The growth of conidia is inhibited by residues containing just sufficient copper to cause toxicity, but it is renewed when they are transferred to a suitable medium.

BOND (T. E. T.). **Disease relationships in grafted plants and chimaeras.**—*Biol. Rev.*, xi, 2, pp. 269–285, 1936.

A summary, supplemented by a three-page bibliography, is given of contemporary literature on the pathological relationships of grafted plants and chimaeras [cf. *R.A.M.*, xv, p. 522].

WILLIAMS (J. C.). **An hypothesis concerning bacteriophagy.**—*J. phys. Chem.*, xl, 4, pp. 477–478, 1936.

The hypothesis is advanced that bacteriophage may be a suspension of minute crystals of one or more of the compounds comprising the homologous bacteria, in which case bacteriophagy would represent the seeding of these amorphous compounds by the phage particle and their subsequent crystallization.

Evidence of the particulate nature of bacteriophage has been presented by various workers, and the size of the particles of different phages has been measured [*R.A.M.*, xv, p. 168]. The antigenic properties of phage indicate that it is a protein, a fact confirmed by Schlesinger's analysis (*Biochem. Z.*, cclxxiii, p. 306, 1934) of a phage in which 13 per cent. nitrogen was found. Proteins being hard to crystallize, spontaneous crystal formation would be expected to be rare and seeding highly specific, both of which conditions are in accord with the character of bacteriophage, a particular phage attacking only its homologous bacteria and closely related species.

When bacteria are attacked by phage a number of cells simply disappear, while others swell and finally burst, both these processes being

the logical outcome of the action of crystallization. Further support is lent to the crystallization theory by the sensitiveness of bacteriophage to protective substances and high viscosity. Thus, bacteriophagy was shown by Bronfenbrenner and Hetler (*Proc. Soc. exp. Biol. Med.*, xxx, p. 1308, 1933) to be inhibited by the presence in the medium of 4 to 5 per cent. agar, while Colvin (*J. infect. Dis.*, li, p. 527, 1932) and Evans (*Publ. Hlth Rep., Wash.*, xlviii, p. 411, 1933) demonstrated a similar effect in respect of serum, ascitic fluid, saliva, pus, and urine, and D'Hérelle (Le Bactériophage, Monogr. Inst. Pasteur, p. 95, 1921) reported inactivation with glycerol. A further indication of crystallization may be the granular appearance of bacteria subject to bacteriophagy. In conclusion, some possible objections to the crystallization hypothesis are briefly discussed, the implication being that improved methods of procedure would dispose of any apparent flaws in the theory.

YOUNG (H. E.). **A mycorrhiza-forming fungus of Pinus.**—*J. Aust. Inst. agric. Sci.*, ii, 1, pp. 32–34, 1936.

Boletus granulatus has been found in Queensland growing in association with *Pinus caribaea*, *P. taeda* [*R.A.M.*, xiii, p. 458], *P. patula*, *P. radiata*, *P. echinata*, and *P. longifolia*, the chief species of exotic pines planted in the State. The thick mycelial threads attached to the base of the stipe of the sporophores were occasionally traced to the coralloid ectendotrophic mycorrhiza on the roots. Isolations from the sporophores grew best on malt sucrose agar.

Seed of *P. caribaea*, *P. taeda*, and *P. patula* sterilized in mercuric chloride solution (1 in 1,000) and washed, was sown in autoclaved soil in glass-sided containers, the root systems being inoculated with a pure culture of *B. granulatus* when the seedlings averaged about 10 in. in height. Eight weeks later coralloid mycorrhiza enveloped the new root buds, the uninoculated controls showing no mycorrhizal development. The coralloid masses were initiated by the envelopment of a young root bud with a weft of hyphae, the bud then branching dichotomously, and each bud being in turn enveloped by the hyphae. The mycorrhiza averaged 2 mm. in length; for the first few weeks the hyphae are snow-white, later becoming light to dark brown. Sections showed the mycorrhiza to be ectendotrophic, with an external layer on the root cortex and an intercellular penetration of hyphae forming the characteristic Hartig net. Intracellular growth was rare. The layer of hyphae on the cortex was often half as thick as the latter; it enveloped the root tips when the root cells were much reduced in number.

When *P. caribaea* and *P. patula* seedlings in pots were inoculated with a culture of *B. granulatus* on sterilized oats vigorous growth resulted, the foliage becoming a healthy green, though control seedlings in uninoculated pots showed little or no growth, a purplish-red foliage, and finally died [cf. ibid., xv, p. 456].

NIGAM (B. S.). **Physiology of zonation — effect of light and temperature on zonation in Acrothecium lunatum Wakker.**—*J. Indian bot. Soc.*, xv, 2, pp. 115–123, 1 diag., 1936.

Two zones of growth were found to be produced every 24 hours in cultures on 2 per cent. rice agar of *Acrothecium lunatum* [*Curvularia*

lunata: *R.A.M.*, xv, p. 496] isolated from red spots on sorghum leaves at Cawnpore when exposed to alternations of light and darkness [cf. ibid., iv, p. 628], pink circles being formed during the day and white ones at night. Alternating zones are produced at a temperature range of 73° to 93° F. in daylight, but in continuous absolute darkness zonation is absent, as it is also inside the incubator, where the colonies, however, are aerial and of a dense bottle-green colour. Smoky colonies surrounded by a white ring of young growth are formed under the influence of electric light at 76° to 93°, and also under that of red light at the latter temperature, whereas in red light at 76° the colonies are deep pink, encircled by a white ring of new growth [cf. ibid., iv, p. 374].

LEONIAN (L. H.). **Control of sexual reproduction in Phytophthora cactorum.**—*Amer. J. Bot.*, xxiii, 3, pp. 188–190, 1936.

No growth is made by *Phytophthora cactorum* in a solution consisting of the essential salts and dextrose, but the addition to such a medium of 0·2 per cent. proteose peptone induces satisfactory development [cf. *R.A.M.*, xv, pp. 42, 109], a similar effect further resulting from the use of malt and yeast extracts, anticitrin, corpora lutea, ovarian substance, and other products tending to stimulate the reproductive mechanism. Growth-promoting substances [cf. ibid., xv, p. 309] do not necessarily induce sexual reproduction and a number of powerful sex hormones of animal origin failed to exert any influence on the fungus. No sexual organs were formed in a solution composed of the essential salts, glucose, and peptone, but a mycelial colony produced on the latter medium, washed, and transferred for an hour to pea infusion begins to form oogonia and antheridia, and continues to do so even after another washing, and removal to distilled water. Sexuality in *P. cactorum* is inhibited by the presence in the medium of 0·1 per cent. tartaric acid, 0·2 per cent. potassium carbonate, or 2 per cent. proteose peptone. Evidence was obtained that the fungus is unable to synthesize growth- and reproduction-promoting substances from the nutrient solution but must be supplied from an external source, such as the above-mentioned pea infusion.

BROWN (W.). **The physiology of host-parasite relations.**—*Bot. Rev.*, ii, 5, pp. 236–281, 1936.

The writer summarizes and discusses some outstanding contributions to the knowledge of the relationships between fungal parasites (facultative and obligate) and their hosts, with observations on the factors involved in the development of resistance or susceptibility, and a brief reference to the theory of acquired immunity, a critical review of the literature on which has been published by Chester [*R.A.M.*, xiii, p. 116; xv, p. 389]. Most of the recent papers cited in the bibliography of 149 titles appended to the present article have been noticed in this *Review*.

CRÉPIN (C.). **Quelques réflexions à propos de la Pomme de terre.** [Some observations in connexion with the Potato.]—*C.R. Acad. Agric. Fr.*, xxii, 11, pp. 437–440, 1936.

In this paper (preceded by an introductory note on pp. 436–437 by [E.] Schribaux), the writer sums up the knowledge at present available

on potato degeneration [see next abstracts], which he attributes to the action of transmissible, hereditary, and incurable virus diseases, such as leaf roll, mosaic, and streak [*R.A.M.*, xv, p. 247]. Plants cultivated under conditions permitting the total exclusion of the aphid vectors of virus diseases remain healthy and produce sound progeny. Selection (involving the timely roguing of diseased individuals in a stand) is stated to be an unfailing remedy against virus degeneration, but it is more easily practised in regions relatively free from aphid infestation (e.g., in the maritime climates of Holland, Scandinavia, Brittany, and in mountainous districts) than in the hot, dry plains. It must be emphasized, however, that although selection is comparatively simple in the mountains, diseased plants do not actually recover on transference to the heights, and the so-called 'altitude cure' is entirely illusory [ibid., xv, p. 523]. The procurement of selected seed, which is legally defined as consisting of tubers from stands subjected to systematic roguing, is of great importance, for the maximum yields are obtained from healthy plants cultivated under optimal environmental conditions.

PRIEN. **Ist eine Bekämpfung des Kartoffel-Abbaues möglich?** [Is a campaign against Potato degeneration practicable?]—*Dtsch. landw. Pr.*, lxiii, 5, p. 57, 1936.

Potato degeneration, which the writer attributes primarily to virus infection [*R.A.M.*, xv, p. 391], is stated to be controllable only by indirect measures, including the procurement of seed (5 per cent. of the total requirement being renewed annually) from healthy ('non-degenerating') districts; the use of relatively resistant varieties; cultivation of the crop alternately on different soil types, e.g., mineral and bog soils; the provision of optimal growth conditions by cultural practices; and the raising of healthy stands for propagation by the use of eyes only, so as to preclude the transmission of degenerate tendencies through the flesh and skin [see next abstract]. To this end the eyes are excised with as little adhering flesh as possible and planted out at the end of April or early May at intervals of 20 to 25 cm. in shallow furrows 30 to 40 cm. apart. The seedlings thus obtained are stated to be remarkably healthy and to produce almost as many seed tubers as those from whole potatoes, while the total yield is about half the normal.

BERKNER [F.]. **Zur Frage des Kartoffel-Abbaues. Ist es möglich, die Neigung zum Kartoffel-Abbau hinauszuschieben?** [On the question of Potato degeneration. Is it possible to postpone the tendency to Potato degeneration?]—*Dtsch. landw. Pr.*, lxiii, 14, p. 167, 1936.

Commenting on Prien's method of preventing potato degeneration by the use of 'eyes' from healthy tubers [see preceding abstract], the writer confirms the validity of this technique from his own experience. He then briefly describes his own practice of pregermination, whereby it is stated to be easy under Silesian conditions to obtain two good harvests in one season, the first crop being planted out (after germinating in boxes in diffuse light) about the end of March to middle of April and lifted about 10th July, between which and 22nd July the second (medium late) may be planted. By this means the field is left free

during the latter part of the year for fodders, cabbage, late flax or hemp, and the like. From the second potato crops the yields during 1930–33 have averaged 121 dz. [12,100 kg.] per hect., while the progeny of such plantings remain free from degeneration and produce yields exceeding by 30 per cent. or more those of ordinary stands. It has been shown elsewhere [ibid., xv, p. 457] that the planting of the second crop before about 10th July is liable to induce severe symptoms of degeneration in the progeny.

Busse [G.]. **Zur Frage des Kartoffelabbaues.** [On the question of Potato degeneration.]—*Dtsch. landw. Pr.*, lxiii, 17, p. 207, 1936.

Some observations are made on the factors affecting potato degeneration [see preceding abstracts] in central Germany (Halle–Leipzig district). In general, it is not practicable to defer the planting of the early crop until May, so that this means of preventing degeneration is precluded. New seed, especially of late varieties, has to be procured almost every year, preferably from regions where the growing period is shorter. Varieties resistant to wart [*Synchytrium endobioticum*] are less liable to run out than other sorts, among which Erdgold and Industrie tend strongly to degenerate.

Wenk (H.). **Kartoffelzüchtungsfragen. I. Teil: Staudenauslese und Pflanzgutbau bei Kartoffeln.** [Potato breeding questions. Part I: Hill-selection method and seed production in Potatoes.]—*Prakt. Bl. Pflanzenb.*, xiv, 1, pp. 2–13, 4 figs., 1936.

The following observations are of interest in connexion with the control of potato diseases by breeding. Extensive experiments in the elimination of leaf roll by the hill-selection method gave unsatisfactory results from the control standpoint but yielded valuable information in other respects. It was noticed, for instance, that a sound progeny generally sprang from normally maturing plants, whereas plants remaining green beyond the term of natural discoloration produced unhealthy offspring. Such plants may be more than ordinarily prolific in the first season but tend to fall off rapidly in subsequent years.

Under the climatic conditions of Weihenstephan, Bavaria, the continuous production of healthy seed can be effected only by the use of fair-sized tubers closely planted on light soils. The Industrie and Wohltmann varieties appear to be the best suited among those tested for local cultivation, Pepo and Deodara degenerating rapidly even in the most favourable sites. A judicious manuring scheme is of great importance in the promotion of resistance to disease. Early applications of stable manure in moderate amounts and a green fertilizer are always appropriate, while phosphoric acid also appears to be serviceable. A storage temperature of 0° to 7° C., such as can be maintained in an underground cellar, has been found much more conducive to health than the relatively high ones prevailing in the rooms ordinarily available for this purpose.

The spread of virus diseases is thought to be largely dependent on environmental influences and other external factors, such as the annually fluctuating incidence of the aphid vectors. During the last few years the timely detection of virus symptoms has been greatly

simplified by the excision during January of eyes from the tubers which are rapidly germinated in the greenhouse and within six or eight weeks clearly show the symptoms—often masked in the field—of infectious mosaic and disturbances of the leaf-roll type.

It follows from the data here presented that a successful breeding scheme must be based, on the one hand, on the provision of favourable environmental conditions, and on the other, on the punctual extermination of all individuals suffering from infectious diseases. Some practical recommendations for the application of the principles herein laid down are given.

SCHICK (R.). & LEHMANN (H.). **Zur physiologischen Spezialisierung von Phytophthora infestans de Bary. Zugleich ein Beitrag zur Methodik der Züchtung krautfäulewiderstandsfähiger Kartoffeln.** [On physiological specialization in *Phytophthora infestans* de Bary, simultaneously with a contribution to the technique of breeding Potatoes for blight resistance.]—*Züchter*, viii, 2, pp. 34–46, 1 fig., 2 diags., 1936.

A detailed account is given of the writers' experiments at the Müncheberg Plant Breeding Institute with four monosporangial lines of *Phytophthora infestans* [*R.A.M.*, xiv, p. 390 and next abstract] grown in pure culture on malt extract agar, potato tubers, and potato foliage. The 246 clones, representing the F_1, F_2, F_2', F_3', and F_4' progenies of crosses between *Solanum demissum* and potato, inoculated with the four lines (nos. 1 to 4, no. 2 being that designated by Müller as the S type), were divided into five groups on the basis of their reaction, viz., A (resistant to all lines), W (to 1, 3, and 4 only), K (to 1 and 2 only), M (to 1, 2, and 3 only), and Z (to none). The A group contained 82 clones; W (to which Müller's W races belong), 100 clones; K, 44; M, 6; and Z, 14. The importance of the different lines from the plant-breeding standpoint is discussed, stress being laid upon the fact that in this connexion geographical distribution is a minor consideration compared with pathogenicity towards the test assortment, which comprises clone 34,1567/20 (belonging to group A), Müller's Sämling 51 573 (W), clone 34,2109/2 (M), Knappes Sämling 87615 (K), and Parnassia (Z). The possibility of the origin and detection of further races of the fungus is also envisaged.

SCHICK (R.) & SCHAPER (P.). **Das Verhalten von verschiedenen Formen von Solanum demissum gegenüber 4 verschiedenen Linien der Phytophthora infestans.** [The reaction of various forms of *Solanum demissum* to 4 different lines of *Phytophthora infestans*.]—*Züchter*, viii, 3, pp. 65–70; 4, pp. 102–104, 1936.

Various forms of *Solanum demissum* were inoculated with four different lines of *Phytophthora infestans* [see preceding abstract], with the result that some manifested complete resistance, others extreme susceptibility, while others again reacted divergently to the various lines. In addition to forms homozygous for resistance there were many cases of segregation in reaction to the different lines of *P. infestans*. For further testing (in which strict attention must be paid to this segregating tendency) only the following forms of *S. demissum* are suitable: *utile*, *tlaxpehualcoense*, El Desierto, Reddick 525, 530, 531, 533, strains of *xitlense*, von Bukasow's form, and one from Rio Frio. There

is considered to be a possibility, however, of isolating absolutely resistant strains from later generations of the segregants.

It is apparent from the outcome of these tests that no general statement can be made regarding the resistance of *S. demissum* to *P. infestans*, any such observation being restricted to particular forms of the host and to certain strains of the fungus. Similar considerations are probably applicable to the various forms of *S. antipovichii*, *S. ajuscoense*, and *S. verrucosum*.

SELARIÈS (P.) & ROHMER (G.). **La maladie verruqueuse de la Pomme de terre en Alsace.** [Potato wart disease in Alsace.]—*Ann. Epiphyt.*, N.S., i, pp. 23–55, 26 figs., 1936.

After reviewing the progress of potato wart disease (*Synchytrium endobioticum*) in Alsace [*R.A.M.*, v, p. 446 *et passim*], and describing the life-history of the parasite, the author tabulates and discusses the results of varietal resistance tests carried out in a heavily infected plot since 1926. In general, foreign varieties showed the same resistance to wart disease as they were reported to do in their country of origin. The reputedly resistant Dutch Commandant variety showed infection in 1926, but remained healthy in each of the five following years, the Favoriet variety behaving somewhat similarly. Triumph potatoes were attacked in 1933, and the Polish variety Ursus in 1930. On both the last-named varieties laboratory inoculations produced characteristic galls. Certain tomato varieties and *Solanum dulcamara* also proved susceptible.

In laboratory infection tests varieties generally resistant in the field readily developed the disease, though in many instances scarcely any outward sign of infection was apparent. In microtome sections prosori and summer sporangia were very rarely present, and all the sporangia appeared to be developing the resting condition in which they produce only asexual zoospores [ibid., xv, p. 524] incapable of causing the cysts observed on the affected plants; thus primary infection appears to have been so rapid and slight as to have escaped notice, and all the cases that were observed must have been due to secondary infections.

Tests by Miss Glynne's method [ibid., v, p. 445] showed that at the beginning of December the percentages of empty, living, and dead sporangia in gall tissue were, respectively, 5 to 10, 10 to 15, and 75, the corresponding figures for the end of February being 53, 16, and 31. Numerous experiments demonstrated that under favourable temperature and humidity conditions the sporangia mature and release zoospores principally from January onwards. During November and December the percentage of empty sporangia present increases slowly. In nature the emission of the zoospores probably occurs later, reaching a maximum towards May, when the average temperature remains at about 21° C.

DUCOMET (V.) & DIEHL (R.). **La galle verruqueuse de la Pomme de terre (Synchytrium endobioticum [Schilb.] Perc.). Mise au point de la question de la résistance des variétés.** [Wart disease of potatoes (*Synchytrium endobioticum* [Schilb.] Perc.). A critical summary of the question of varietal resistance.]—*Ann. Epiphyt.*, N.S., i, pp. 57–79, 2 maps, 1936.

After reviewing the history of the introduction of potato wart disease

(*Synchytrium endobioticum*) [see preceding abstract] into the countries where it prevails the authors state that in France the disease is present only in a few small localized centres of infection near the northern, eastern, and southern frontiers. In the north of France new infection centres are due more to the introduction of foreign tubers than to the spread of already existing diseased areas.

Varietal resistance trials with nearly 300 varieties and numerous hybrids conducted at Russ-Hersbach (Bas-Rhin) from 1926 to 1935, inclusive, gave results which generally agreed with those obtained in other countries. Of the 180 potato varieties grown in France 77·5 per cent. are of foreign origin and only 25 per cent. are resistant. A large number of old French varieties are also susceptible.

Observations in France supported Köhler's views as to infection grades [*R.A.M.*, xi, p. 69], the Ovalgelbe variety showing galls on the leaflets and Sickingen being once slightly attacked; both varieties are placed by Köhler in grade III of tolerance. It appears that under certain conditions favourable to tissue proliferation some reputedly resistant varieties may be very slightly attacked and serve as a source of spread.

The evidence obtained indicated that crosses between resistant varieties invariably, and selfed resistant varieties mostly, gave rise to a certain number of susceptible types in the progeny, while susceptible varieties in some cases gave rise to a few resistant types, though the authors did not personally observe this. The results obtained in some cases support Black's views as to the factorial basis of resistance [ibid., xiv, pp. 465, 788].

A study of tuberiferous species of *Solanum* showed that types susceptible to *S. endobioticum* are present in all chromosome groups.

Raleigh (W. P.) & Bonde (R.). **Seed-Potato treatment for Rhizoctonia control in northeastern Maine, 1929 to 1933.**—*Phytopathology*, xxvi, 4, pp. 321–343, 1936.

The methods used in the present series of seed-potato treatment experiments in north-eastern Maine corresponded approximately to those followed by Schultz and collaborators in the period 1925 to 1928 [*R.A.M.*, ix, p. 404; cf. ibid., xv, p. 484]. The results [which are fully tabulated] of the tests showed that treatment of tubers infected by *Rhizoctonia* [*Corticium solani*] usually increased the stand, vigour of the plants, and yield, and reduced injury from stem lesions and the percentage of diseased tubers. One of the best treatments against *C. solani* was 1½ hours' immersion in mercuric chloride (1 in 1,000), while three minutes in acidulated mercuric chloride (1 in 500 plus 1 per cent. hydrochloric acid) also gave satisfactory control but tended to damage the tubers. Yellow mercuric oxide (1 in 100), used as a dip, also combated the fungus effectively but was liable to burn the cut surfaces of the tubers. Promising results were given by a solution of 1 in 1,200 mercuric chloride and 1 in 400 potassium iodide (dip), while the organic mercury dips, sanoseed and new improved semesan bel [ibid., xiv, p. 118; xv, p. 486], though superior to the brands formerly on the market, did not quite equal the standard mercuric chloride treatment in efficacy against *C. solani*. Clean Irish Cobblers, treated or un-

treated, in a separate test produced a crop bearing very few *C. solani* sclerotia.

Goss (R. W.). **The effect of irrigated crop rotations upon Potato scab.**—*Amer. Potato J.*, xiii, 4, pp. 91–96, 1936.

Details are given of an experiment which has been in progress in western Nebraska since 1912 to determine the effect of irrigated crop rotations on potato scab [*Actinomyces scabies*: *R.A.M.*, xv, p. 394 and next abstracts]. Eleven ¼-acre plots on a well-drained, sandy loam soil were included in the trials, and since 1920 the Bliss Triumph variety has been consistently used.

The average incidence of severe scab from 1929 to 1932, inclusive, in the continuous potato plot was 53·6 per cent., the corresponding figures for the stands following beets, oats, and maize being 55·7, 39·6, and 66·4, respectively. The first indication of a reduction in the amount of infection was obtained in a four-year rotation consisting of beets, lucerne (two years), and potatoes, the incidence of severe scab for the period 1929 to 1932 being only 4·4 per cent. and from 1933 to 1935, 2·5 per cent. Even better results were secured by a six-year programme involving oats, beets, three years of lucerne, and potatoes, the incidence of severe scab in the plots thus treated being reduced to 1·8 and 1 per cent., respectively, during the two periods under review. A noticeable increase in the amount of deep scab was directly correlated with the application of manure to the plots, but in the case of the short rotations this practice would appear to be justifiable by the resultant large increases of yield (127 per cent. following beets, 102 following oats, and 56 following oats and beets).

Cunningham (H. S.). **The addition of mercury compounds to the fertilizer mixture as a control for common scab of the Potato under Long Island conditions.**—*Amer. Potato J.*, xiii, 4, pp. 100–103, 1936.

Very satisfactory control of scab [*Actinomyces scabies*: see preceding abstract] in Irish Cobbler and Green Mountain potatoes in a sassafras silt loam with a gravelly subsoil (P_H 5 to 5·7) in Long Island, New York, was obtained in 1934–5 by the addition to the fertiliser of either yellow oxide of mercury or calomel [mercurous chloride: *R.A.M.*, xv, p. 283] at rates of 4 to 6 lb. per ton, the former probably being adequate for all practical purposes. Yellow oxide of mercury was found to be slightly the more effective of the two, reducing the amount of severe infection to under 1 per cent. in both varieties.

Einfluss der Düngung auf den Schorfbefall der Kartoffeln. [The influence of manuring on scab infection of Potatoes.]—*Superphosphate*, ix, 4, pp. 78–80, 1 fig., 1936. [English and French translations.]

In this paper (abstracted from *Wbl. LdBauernsch. Sachsen*, lxxxiii, p. 1642, 1935) it is stated that Prof. Pieper, of the Dresden Agricultural Experiment Station, recommends the following measures for potato scab [*Actinomyces scabies*: see preceding abstracts] control. Lime should be applied as a top dressing after the emergence of the plants, and not in the spring or autumn before planting. Three to four years later, when the same soil is again planted to potatoes, the lime will be

found to be so extensively decomposed as to constitute no further risk of promoting the disease. The choice of mineral fertilizers is important, alkaline materials, such as nitrate of soda, calcium cyanamide, and basic slag, being liable to induce scab [cf. ibid., xv, p. 415], while sulphate of ammonia and superphosphate prevent its development. These observations were amply confirmed by experiments conducted at Pillnitz from 1932 to 1935 with the Early Zwickau variety.

TAYLOR (C. F.). **A method for the isolation of actinomycetes from scab lesions on Potato tubers and Beet roots.**—*Phytopathology*, xxvi, 4, pp. 387–388, 1936.

The following technique has given satisfactory results during the past six years in the isolation of *Actinomyces* from potato tubers and beet-roots. Ten gm. of fresh calcium hypochlorite is shaken in 140 c.c. tap-water, left to stand for a few minutes, and filtered. Just before use 1 part of 25 per cent. sodium hydroxide solution is added to 3 of the filtrate. The plant material is placed in this mixture for two minutes, and on removal, without washing, a slice is cut in such a way as to remove a lesion and the underlying healthy tissue, placed in a few drops of sterilized distilled water in a flamed mortar, and triturated with a flamed pestle. Additional water is then added to the mortar and the diluted suspension pipetted into a sterilized tube, one or two drops from which are placed in the bottom of a Petri dish, followed by 15 c.c. of Waksman's egg-albumin agar (*Soil Sci.*, viii, p. 71, 1919) melted and cooled to 45° C. Colonies develop within a period of two days to three weeks.

KUNKEL (L. O.). **Powdery mildew of Potato in New Jersey.**—*Phytopathology*, xxvi, 4, pp. 392–393, 1 fig., 1936.

In February, 1935, Green Mountain potato plants in the greenhouse of the Rockefeller Institute for Medical Research, Princeton, New Jersey, showed an extensive spotting, chiefly of the upper surfaces of leaves nearing maturity. During cloudy weather a powdery mildew developed over the affected areas and spread to the under sides of the leaves and to the petioles and stems. The barrel-shaped conidia, 34·19 by 18·09 μ, were borne on short conidiophores and the mycelium was attached to the epidermal cells by means of globoid haustoria. In the absence of perithecia, the exact determination of the fungus was impossible, but it is presumed to be *Erysiphe solani* [? *E. cichoracearum*: *R.A.M.*, i, p. 361; vi, p. 250; xiii, p. 681; xiv, p. 83]. This appears to be the first record of potato mildew in the United States.

REINKING (O. A.). **Cylindrocarpon fungus studies.**—*Zbl. Bakt.*, Abt. 2, xciv, 5–8, pp. 134–136, 2 figs., 1936.

Latin diagnoses are given of two new varieties of *Cylindrocarpon* found to be fairly common occupants of the soil [cf. *R.A.M.*, xiv, pp. 378, 791] of banana plantations in Honduras, Costa Rica, Panama, and South America [see next abstract], viz., *C. janthothele* Wr. var. *minus* and *C. olidum* Wr. var. *suaveolens*, the perfect stage of the former being *Nectria mammoidea* Phil. & Plowr. var. *minor*.

REINKING (O. A.). **Cylindrocarpon-isolations from tropical soils.**—*Zbl. Bakt.*, Abt. 2, xciv, 5–8, pp. 137–142, 1936.

The following fungi, in decreasing order of prevalence, were isolated from the soil of low-lying banana plantations in Honduras, west coast of Guatemala, Costa Rica, Panama, and Colombia: *Cylindrocarpon olidum* var. *suaveolens*, *C. olidum*, *C. janthothele* var. *minus* (*Nectria mammoidea* var. *minor*) [see preceding abstract], *C. curvatum* [*R.A.M.*, x, p. 626], and *C. radicicola* [ibid., xiv, pp. 180, 366, 585]. With the exception of the last named, all the organisms were isolated from soil depths varying from 1 to 23 in., *C. radicicola* being found only at and below 5 in. The phytopathological significance of these species of *Cylindrocarpon* has not yet been investigated.

SALMON (E. S.). **Fungus and virus diseases of the Hop; II.**—*J. Inst. Brew.*, N.S., xxxiii, 4, pp. 184–186, 1936.

Continuing his observations on hop diseases in England [*R.A.M.*, xv, p. 461], the writer gives notes on the wilt caused by *Sclerotinia sclerotiorum* [ibid., xv, p. 425], which is reported to have destroyed up to 40 per cent. of the bine in some Midland yards; on two cases of infection by *Armillaria mellea* in 1935, one in Kent and the other in Worcestershire; and on 'fluffy tip' or 'bunchy top' [ibid., xv, p. 424], nettlehead [ibid., xv, p. 462], and mosaic.

Some new symptoms, including splitting of the leaf blade and conspicuous yellowish-green mottling, have frequently been observed both alone and in association with nettlehead; in the former case they appear to be relatively innocuous. Nettlehead proper, however, is stated to present increasing difficulties in old-established Fuggle gardens, which when badly infected should be grubbed up and replanted with the newly developed resistant Brewer's Favourite, Fillpocket, or Quality Hop varieties.

GOODWIN (W.) & SALMON (E. S.). **Infectious sterility in Hop gardens in Czecho-Slovakia.**—*J. Inst. Brew.*, N.S., xxxiii, 4, pp. 209–210, 1936.

A summary is given of the main features of the infectious sterility disease of hops in Czecho-Slovakia, based on a recent account by Blattný and Vukolov already noticed from the original source [*R.A.M.*, xv, p. 395].

ABBOTT (E. V.), SUMMERS (E. M.), & RANDS (R. D.). **Disease resistance tests and seedling selections in 1935 at the U.S. Sugar Plant Field Station, Houma, La.**—*Sug. Bull.*, xiv, 12, pp. 3–7, 1936.

The main object and outstanding problem of the seedling programme in sugar-cane breeding work is the development of varieties combining in a single individual disease resistance, productivity, and economical handling, and during 1935 noteworthy progress in these directions is stated to have been made at the Houma Sugar Plant Field Station, Louisiana. Four classes have been differentiated to express the pathological reactions of the test canes, viz., (1) resistant, (2) moderately resistant, (3) susceptible, and (4) very susceptible. The high standards requisite for inclusion in (1), comprising immunity from mosaic [*R.A.M.*, xiv, p. 718], resistance to red rot [*Colletotrichum falcatum*: ibid., xv,

p. 463 and next abstract], and relative freedom from liability to other diseases, preclude many entries, but since 1929 a total of 74 selections have been placed in this group at the Station. C[anal] P[oint] 28/19 is a typical representative of (2), combining freedom from mosaic with moderate resistance to red rot (140 selections now available, making a total, with those of class (1), of 214 commercially resistant canes). In (3) are placed seedlings susceptible to *C. falcatum* but free, or virtually so, from mosaic and only moderately subject to other diseases, e.g., P.O.J. 36–M, Co. 290, and C.P. 29/320. To date the number of selections in this 'borderline' class, the commercial adequacy of which needs further testing, is 205. To (4) belong varieties such as P.O.J. 213, C.P. 807, and C.P. 29/291, which are very susceptible to either or both of the two principal diseases under consideration or are subject to severe infection by other agencies. At present such commercially 'dangerous' canes number 22.

Details are given of the qualities of various selections in the different classes.

JENSEN (J. H.). **Notes on the present Sugarcane-disease situation in Puerto Rico.**—*Agric. Notes P.R. agric. Exp. Sta.*, 69, 8 pp., 1936. [Mimeographed.]

The most severe disease of sugar-cane in Porto Rico is mosaic, which, however, is being fairly well controlled in most localities by roguing or the planting of the resistant varieties P.O.J. 2878, Mayaguez 28, P.R. 803, and P.R. 807 [cf. *R.A.M.*, xiv, p. 607]. The presence of different types of mottling in different parts of the island indicate that two or more strains of the virus exist in Porto Rico.

Ring spot (*Leptosphaeria sacchari*) [ibid., xv, p. 397], brown stripe (*Helminthosporium stenospilum*) [loc. cit.], and eye spot (*H. ocellum*) [ibid., xiv, p. 564] occur in all parts of the island but do not cause serious losses, most of the varieties grown not being highly susceptible. Dry top rot (*Plasmodiophora* [*Ligniera*] *vascularum*) [ibid., xiv, p. 397], pokkah-boeng (*Fusarium moniliforme*) [*Gibberella moniliformis*: ibid., xv, p. 397], red stripe (*Phytomonas* [*Bacterium*] *rubrilineans*) [ibid., xv, p. 427], and red rot (*Colletotrichum falcatum*) [see preceding abstract] do not cause serious damage. The cane in a fairly extensive area along the south coast shows symptoms resembling Pahala blight [ibid., xii, p. 788], consisting in a leaf discoloration varying from slight yellowing to almost complete whiteness; only the interveinal parts are affected, the veins appearing dark green. The low manganese content and alkaline condition of the soil indicate that the disease is due to manganese deficiency.

To guard against the importation of cane diseases a moated, screened, and insulated quarantine greenhouse is being erected in Porto Rico where newly introduced cane pieces and other economic plants will be kept under observation.

BAISSAC (J.). **Diseases and pests of the Sugar Cane in Nossi Bé, Madagascar.**—*Int. Sug. J.*, xxxviii, 448, pp. 130–132, 1936.

In these notes on sugar-cane diseases in Madagascar it is stated that ring spot (*Leptosphaeria sacchari*) [see preceding abstract] is very wide-

spread, the plants readily becoming affected in unfavourable weather conditions. Brown leaf spot (*Cercospora longipes*) [ibid., xiv, pp. 87, 257] often occurs at the end of the dry season. Red spotting (*C. sacchari*) [ibid., xiv, p. 348] also exists. Bobbin-shaped, septate spores measuring 10 to 20 by 3 μ, resembling those of *C. acerosum*, were noted on an indefinite leaf spot. Stem smut (*Ustilago sacchari*) [*U. scitaminea*: ibid., xiii, p. 473] occurs occasionally; usually it does not kill the stool, but in one instance part of a field showed 10 per cent. infection, with many dead plants. Red rot [*Colletotrichum falcatum*: see preceding abstracts] occurs frequently in some varieties, following infestation by borers, and together with scald (*Bacterium albilineans*) is regarded as being the probable cause of the failure of the older varieties, such as Louzier and Iscambine. Pokkah-boeng (*Fusarium moniliforme*) [*Gibberella moniliformis*] affects all types of canes, but appears most often on *spontaneum* hybrids of the first, second, or third nobilizations. Root diseases include seedling damping-off (in clogged soils) associated with a fungus resembling a *Rosellinia* and *Himantia stellifera* [ibid., iv, p. 705]. Leaf scald (*Bact. albilineans*) is widespread; in most cases the whole crown dries up and the top quickly dies without the appearance of white stripes. Even the leaves of the young shoots developed from the lateral buds, after the death of the top, are more often scalded than striped. A bacterial leaf stripe was first observed in 1932 on a seedling of noble origin, since when it has been found on many other canes. The symptoms develop as streaks 2 to 3 mm. long on the fully grown leaves, and ultimately reach the younger ones, followed by a marked shortening of the internodes corresponding to the affected leaves. The diseased stools show rapid growth of the bacteria in the ratoons, with heavy loss of cane by shortening of the stems. *Melanconium* [*Pleocyta*] *sacchari* [ibid., xiv, p. 656] occurs frequently as a weak parasite.

GÄUMANN (E.). **Mykologische Notizen II.** [Mycological notes II.]—*Ann. mycol., Berl.*, xxxiv, 1–2, pp. 61–68, 1936.

In order to elucidate the connexion between the aecidia on *Euphorbia virgata* and those on hybrids of *E. virgata* and *E. cyparissias* in moist situations near Zürich (both *E. cyparissias* and its hybrid with *E. virgata* being commonly and severely attacked by aecidia of the *Uromyces pisi* group [*R.A.M.*, xi, p. 760]), the writer inoculated with aecidiospores from the first-named host seven Leguminosae, of which only *Vicia cracca* responded by profuse formation of uredosori, indicating that the fungus belongs to the *U. fischeri eduardi* group. Uredospores of the rust from *E. virgata* were only slightly pathogenic to *V. sativa* and failed to attack any of the other species of *Vicia* inoculated except *V. cracca*, indicating the existence of physiologic specialization in *U. fischeri eduardi*. In a third series of tests an abundance of teleutospore-bearing material from plants used in the previous experiments was applied to young shoots of *E. cyparissias*, *E. virgata*, and *E. cyparissias*×*E. virgata* with positive results only in the case of one shoot each of the two first named. Aecidia from these shoots infected *V. cracca*. It is evident from the foregoing data that *E. virgata* is one of the hosts of *U. fischeri eduardi*.

Aecidium hippeastri n.sp. [with a Latin diagnosis], detected on *Hippeastrum bicolor* leaves in Chile, is characterized by densely aggregated, amphigenous pycnidia, 80 to 150 μ in diameter, surrounded by a circle of yellow aecidia producing angular to globose or oblong, densely granular-verrucose, subhyaline spores, 16 to 29 by 15 to 27 μ (mostly 23 to 26 by 19 to 23 μ).

GRIGORAKI (L.). **L'aleurie : ses formes et sa définition.** [The aleuriospore: its formation and definition.]—*Rev. Mycologie*, i (N.S.), 1, pp. 37–39, 1 fig., 1936.

The author defines aleuriospores as uninucleate spores of variable size resulting from the complete or partial dissociation of the protoplasm of a hypha or sporophore. They may be internal or external, and are classified into four kinds, aleurioblastospores, aleuriochlamydospores, aleurioconidia, and microaleuriospores. The first kind are budded off from the mycelium-like yeasts; the second are pleomorphic, broadly pedicillate when external, and resemble small chlamydospores; the third are of constant size, borne on distinct sporophores, and resemble conidia at first but have no distinct pedicel; the fourth kind are generally formed internally, and are liberated by the rupture of a hypha, as in *Actinomyces*.

Spore forms which may be confused with aleuriospores are arthrospores [*R.A.M.*, xiii, p. 163], entospores (a vague term applied by Vuillemin to various forms), conidia, and chlamydospores. Arthrospores are poly- or uninucleate spores formed by the cutting-off of portions of the thallus, conidia are external, uninucleate spores without glycogen reserves, shed without destroying the mycelium, and chlamydospores are always internal, polynucleate, thick-walled, and variable in size.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, viii, 3, pp. 78, 82–83, 86–93, 1936.

GERMANY (HAMBURG). An Order of 30th March, 1936, provides that Douglas fir [*Pseudotsuga taxifolia*] seedlings must be certified as healthy by the local plant protection authorities before distribution for planting in order to combat the spread of leaf fall [*Rhabdocline pseudotsugae*: *R.A.M.*, xiii, pp. 554, 607].

HOLLAND. An Order of 30th October, 1935, prohibits the cultivation of the potato varieties Bravo, De Wet, and Kampioen and of any other plant deemed by the Minister of Agriculture to constitute a probable source of infection by wart disease (*Synchytrium endobioticum*) [ibid., xv, p. 127].

SWEDEN. As from 1st April, 1936, all plants imported into the country with root attached must be accompanied by a certificate stating that the site of cultivation, together with a surrounding radius of at least 5 km., is (and has been during the past ten years) free from infestation by wart disease (*S. endobioticum*).

A Proclamation dated 4th April, 1936, and effective as from the 6th, enumerates thirty pathogenic micro-organisms and two diseases the exclusion of which from Sweden is to be the object of special efforts.